REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE, BURMA

FOR THE YEAR ENDED THE 31st MARCH 1939

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REPORT

ON THE OPERATIONS OF THE

Department of Agriculture, Burma

For the year ended the 31st March 1939.

PART I.

Summary of Work and Progress.

1. In Lower Burma the season was on the whole favourable to the paddy crop. The monsoon broke early and there were no pronounced breaks, while serious flooding was entirely absent. Slight flooding occurred in parts of Hanthawaddy, Insein, Tharrawaddy, Myaungmya, Maubin and Pyapôn Disricts and did some damage to nurseries and to newly transplanted areas. The distribution of rain was unusually good but in many parts of Lower Burma the crop threshed out lighter than expected, the proportion of unfilled grains being abnormally high. Continuous heavy rain during October-November while the paddy was in flower is generally held responsible for this phenomenon which was particularly marked in Thatôn, Amherst, Akyab, Insein and Toungoo Districts and in the Nyaunglebin Subdivision. Outturns are estimated at slightly below normal in Insein West, normal in Hanthawaddy, slightly above normal in Pegu and 25-35 per cent above normal in Tharrawaddy North and Prome. As a result of the comparatively heavy rains in Prome North, sesamum and groundnuts gave a poor yield. In addition to the damage done by continuous heavy rains at flowering time, it is possible that damage done to the seed grain by the unusual rains of December 1937 may be partially responsible for the unexpectedly high proportion of unfilled grain. In Upper Burma, in spite of a total precipitation up to average in most places, following an early break of the monsoon which in general allowed early tillage, except in Myitkyina District there was a pronounced break in the rains from June to August which reduced paddy yields in non-irrigated tracts and seriously reduced the yields of cotton, early sesamum and groundnuts. *Pesinngon* withstood the drought best. Cotton seed was unusually bad on account of the December 1937 rains and in addition, the seed was very expensive at sowing time. Sugarcane did not fully recover from

the effects of the December 1937 rains and gave a poor outturn. The middle and late rains were favourable but copious rain in December did some damage to the tobacco and chilli crops. Yamèthin suffered from deficient early and late rains which reduced the yields of sesamum, maize, *pèsinngon* and beans. Heavy late rains in Sagaing Township did some damage to the wheat and gram crops, the yield of which was poor and a late rise of the river did some damage to *kaing* crops. Although the season in Upper Burma may be described as fair on the whole, it was by no means so favourable as in Lower Burma.

2. There were no severe outbreaks of pests or diseases on paddy. Sporadic attacks of the Rice hispa (*Hispa armigera*), Rice stem borer (*Schoenbius bipunctifer*) and army worm (*Cirphis unipuncta*) or ear cutting caterpillar occurred in various places in Lower Burma. "Ufra", an eelworm disease, is said to have caused fairly serious damage in lowlying parts of Pyapôn, Myaungmya and Moulmeiugyuu Townships and in parts of Bassein Subdivision. A paddy bug identified by the Entomologist as "Scotinophara Coarctata" caused considerable local damage in the Alan Village-tract of Maubin District. The brown spot disease of paddy (*Helminthosporium*) was fairly severe at Mudôn and in Chaungzôn Township. "Akhet-hpet", a nematode disease of paddy, did considerable damage in the Launglon and Thayetchaung Districts of Tavoy, where it is said to be spreading quickly. Applications of fertilizers had no useful effect on the affected areas. Out-breaks of "We-kite-de" disease occurred sporadically in the Sittang Colony areas. There was very little *Myitpo* or *Ywetpo* in Shwebo District, possibly owing to heavy early rains. Onion leaf disease, caused by the Rice stem gall fly (*Pachydiplosis oryzae*) was fairly serious in parts of Myitkyina and Katha Districts. The disease also occurs in Lower Burma.

On upland crops the usual mango borers, sooty mould, scale insects, Lemon Butterfly caterpillars and wilt of betel vine were common in Lower Burma but no very serious damage was done. The combined attack of scale insects and sooty mould on sugarcane is said to have reduced the yield and quality of *kyantaga* in Pa-an Subdivision. In Yamèthin District the top shoots of cane were damaged by a borer, *Diatraea* sp. Wilt occurred on *pèsinngon* but "pothe" was much more serious. Immune varieties appear to offer the only solution to this particular trouble. Fortunately, several immune varieties are now becoming available. Striga Lutea and Smut were prevalent on *pyaung*. Several varieties immune to Striga are now available while control of smut is easy by means of copper sulphate solution, and by several proprietary compounds. The Ticca disease of groundnuts was common, especially on the *kyun*, but little damage was done. Rust of wheat was reported from Minbu and was serious in Sagaing District. Crickets and caterpillars were destructive on *kaing* crops, particularly

tobacco, in parts of Mandalay District. Mildew of betel vine was serious in Kyauksè but dusting with sulphur powder gave good control. Boll insects (*Byaingchi*) and aphis occurred much as usual on cotton and the stem weevil (*Pempheres affinis*) was prevalent. The latter is said to have caused considerable damage on *Wagale* and Cambodia in Mandalay District. Wilt disease of cotton was not so prevalent as in the previous year.

3. During the period January-March, average wholesale prices were as follows :—

			Rs.
Paddy (Rangoon)	...	...	83 (82)
Sesamum (Myingyan)	...	...	223 (302)
Cotton (Myingyan)	...	...	16·7 (17·3)
Groundnuts (Magwe)	...	...	81 (88)
Pegyi (Henzada)	...	...	276 (340)
Pebyugale (Mandalay)	...	...	77 (114)
Pegya (Myingyan)	...	...	85 (124)
Maize (Pyinmana)	...	...	162 (57)
Tobacco (Toungoo)	...	...	25 (50)
Jaggery (Mahlaing)	...	...	14·3 (14·75)

In view of the damage done by the rains of December 1937 and the improved yield of paddy in 1938, some small improvement must have occurred in the position of the paddy cultivator during the year under review. Unfortunately, this has been offset by a very serious fall in prices of most other crops, particularly sesamum and various beans. Cotton opened very weak and most of the crop was probably marketed between Rs. 15 and Rs. 20. Sugarcane, the price of which is subject to special considerations when supplied to the white sugar factories, realized about 50 per cent higher prices than last season but outturns were generally poor. The only other sizeable crop to show a marked improvement in price was maize, the price of which was nearly trebled. It is probable that this increase in price is due to the establishment of a maize starch factory in Rangoon. In brief therefore, although there was probably some slight improvement generally in Lower Burma, the fall in prices for most crops other than paddy indicates that the economic condition of the cultivator in Mid and Upper Burma is, in general, worse than last year.

4. The outstanding event of the year was the re-opening to students of the Mandalay Agricultural College as a constituent college of the University of Rangoon. This is the first step in the policy of development of the Department recommended by the Rice Export Trade Enquiry Committee, for which a considerable increase in trained staff is necessary. Recognition by the University took effect from 16th June 1938, a two-year course leading to a degree of B.Sc. in Agriculture, open to entrants with the I.Sc. qualification of the University of Rangoon with English, Burmese, Mathematics, Physics and Chemistry, being

inaugurated. Government has decided that the subjects of Agriculture, Agricultural Botany and Agricultural Chemistry may be offered in the competitive examination for the Burma Civil Service, Class II and other services so that the scope of the Agricultural College will not be so severely limited as formerly. The college re-opened in June 1938 with a full class of 24 students, fifteen of whom received stipends.

The regular farm schools at Mahlaing, Hmawbi and the Rural Uplift Farm School at Tatkôn as usual gave a full nine months' course to the limit of their accommodation. There were 72 applications for entry to the Mahlaing Farm School and 14 stipends were awarded. Three students dropped out early in the course and were replaced from the waiting list, 12 out of the 14 ultimately passing out successfully. The standard of the students was not quite so good as in the previous year. Only 10 students, all of whom passed out successfully, could be admitted at Hmawbi. These students showed considerable keenness and the number of applications for entry continues to increase yearly. At the Rural Uplift School, the number of admissions was ten and nine passed the examination at the end of the course. Seven of these students came from Yamèthin, two from Toungoo and one from Pegu. In addition to the regular farm schools, courses were given at most of the central farms although there is no proper accommodation except at Mahlaing, Hmawbi and Tatkôn. At Mudôn 32 students were given a month's course, 5 a two months' course and one was trained for the whole year. Nine adults were given a short period of training at the Tatkôn farm, while two students from Toungoo were trained for two months in cane husbandry and *kyantaga* manufacture at Pyinmana. At Allanmyo 15 students were given a two months' course of training while all Revenue Surveyors of Magwe Township visited the Magwe Farm and heard lectures on improved crops and methods. One student was trained for five weeks, four for three months and one for seven months at the Akyab Central Farm. Twelve students were given a course varying from four to six months at the Kanbalu Central Farm and ten completed the period of training. In addition to the above courses, large numbers of cultivators from backward areas were brought to the nearest demonstration areas or central farms to see at first hand the improvements that the Department has to offer. The construction of two more farm schools at Mudôn and Myaungmya during 1939-40 will do a great deal towards the improvement of facilities for giving essentially practical training to the cultivator. The value of these farm schools is established beyond doubt.

There were 24 admissions to the Four Year, 11 to the Three Year and 2 to a special one year course at the American Baptist Mission Agricultural School, Pyinmana. At the beginning of the year there were 78 students on the roll and 46 at the end of the year. Twelve

students out of fourteen successfully passed the examination at the end of the regular four year course. Most of the students from this school subsequently carry out Agricultural work of some kind. The Government grant of Rs. 10,000 per annum was given as usual.

5. Research is mainly carried out at the Agricultural College, Mandalay, at the Central Experimental Farms, of which each circle (except the Southern Circle) has one and at the Rice Research Station, Hmawbi. The Central Experimental Farms in Lower Burma, *i.e.*, Hmawbi, Mudôn, Myaungmya and Akyab are chiefly concerned with paddy and horticultural crops. Mahlaing is chiefly concerned with *Wagale* cotton, sesamum, beans, millets and dry crops, Allanmyo with *Wagyi* cotton and sesamum, Kanbalu with miscellaneous dry crops, Pyinmana with sugarcane while Mandalay deals chiefly with paddies for irrigated areas. Magwe, Sa-aing and Tatkôn are subsidiary experimental farms concerned respectively with groundnuts, tobacco and miscellaneous dry crops. Reference to work carried out at each of these places is necessarily of the briefest description.

In the Agricultural College, Mandalay, are accommodated the laboratories of the Economic Botanist, Agricultural Chemist, Mycologist and Entomologist and each of these officers has allotted to him such land or pot culture shed accommodation as is necessary.

Botany.—Paddy varietal tests with *Yathe*, *Mawlike*, *Thonzaloo* and *Myaukla* failed to show reliable yield differences. Two *Patnai* strains however, proved as good yielders as *Shweal*, *Taungdeikpan* and *Ngayunwabo* which are standard varieties under distribution ; 144 cultures were grown at the Mohnyin Major Seed Farm where *kyetthun* disease was troublesome. Several local varieties yielded well but have a poor type of grain while the hybrids also did poorly. The Patnai varieties did fairly well, being of suitable life period. At Mandalay, certain hybrids out-yielded the standard variety *Taungdeikpan* but not with significance in every case ; 134 cultures of other types, mostly in the F_6 and F_8 generation are also under investigation. On account of complaints of poor storage quality of *Kalagyi* paddy from the Mohnyin area, an investigation was carried out using several types of paddy and it was found that, although *Kalagyi* has a higher affinity for moisture than most other types, it does not discolour more readily than other varieties. Increase of temperature and relative humidity (above 87·4 per cent) increases discolouration. It was concluded that the heavy morning mists in the vicinity of Mohnyin are probably responsible for the trouble. In an examination of the effect of field treatment on milling quality of paddy, it was found that the best rice outturns are obtained by stacking the sheaves with the heads pointing north (the local custom) for 5 days rather than 10 days and by shade rather than sun drying. Milling of paddy with more than 12·5 per cent moisture caused considerable increase in breakage. There is a tendency for the

permanent manurial plots which have received Superphosphate and Farm Yard Manure to show an increased yield with time. The Sulphate of Ammonia plots are tending to show a reduced yield which is not yet, however, significant. Other treatments show no marked tendencies. In course of time these tendencies may assume practical importance. The produce of the permanent manurial series was again examined to see if the varying manurial treatments cause differences in milling. The Minghetti laboratory milling machine was used for the purpose and differences were found to be negligible. Seven pure lines of early sesamum were under multiplication and 29 cultures of Burmese sesamum were grown. Oil contents were generally good, the best being more than 55 per cent. Three varieties of *Pèsinngon* derived from New Era show particular promise and are much superior to C10 which is now under distribution. Storage experiments with the seed indicated that insect attack is largely fortuitous and not an inherited character. Selection of gram and wheat was continued. Wheat sown after harvesting early paddy did not give good results in spite of early promise. "Doob" hay supplied to the army in Burma from Lower Burma appears to be *Sporobolus glaucifolius Hochst* and not the true doob *Cynodon dactylon Pers.* It is, however, finer than doob and equally good as regards mineral content. True doob from Upper Burma is superior to that from Lower Burma as regards protein, phosphate and calcium content and is practically equal to good English hay. Hill grasses are generally much inferior to plains grasses A start has been made with selection of indigenous grasses which have been established in pure culture in small plots. As a result of supply of samples of Prickly Pear Spines to England an interesting small trade has sprung up locally, three firms now buying these spines. Work on cigarette tobacco was continued both in Amarapura and in the districts. The season was unfavourable, considerable trouble with the nurseries being experienced while cut worms were a serious pest on transplants. Results of the year's work will not be available until about July.

Chemistry.—The investigation of the so-called *Myitpo* disease continued to occupy the major share of the Chemist's attention. Certain facts are difficult to reconcile with the theory that the disease is due to phosphate deficiency in the soil. When affected soil is transferred to Mandalay and used for pot experiments, *Myitpo* does not appear. In one experiment on badly affected soil from Ye-U and Kywezin Villages, 500 paddy seeds were planted in each pot and most of them germinated and reached maturity. Such a result would be unlikely if phosphate were really deficient. Further work was done on the chemical composition of affected and non-affected plants. Affected plants are much richer in phosphate. The response to application of superphosphate is therefore most probably indirect. Application of 5 cwts. per acre of filter cake from the Zeyawaddy Sugar Factory gave

increases of 30-50 per cent in the yield. A similar trouble to *Myitpo*, called "*Ahmyit-po*" is under investigation at Zegyogon Village in the Mandalay canal area. Very heavy dressings of superphosphate are required to correct this trouble. Alkalinity of the soil cannot be the cause as this is quite normal between pH 7·7 and 8·1. Investigation of losses of Nitrogen when applied to sugarcane in very heavy dressings point to de-nitrification and rapid loss by percolation in the early part of the monsoon. Work on the composition of grasses is being carried out in co-operation with the Economic Botanist and has already been referred to. Shan oranges do not offer good possibilities for the manufacture of squashes, the flavour being insipid. Valencia types are better for this purpose. Many essential oil containing grasses and seeds from local sources have been examined but only *Sagascin* appears at all promising. Coriander, for instance, has been found to contain only from $\frac{1}{5}$ to $\frac{1}{50}$ of the amount of oil the seed contains when grown in Europe. The manufacture of a road dressing material out of molasses is under examination.

Mycology.—Steeping paddy in water at various temperatures under varying conditions and also steeping in potassium sulphide solution had no effect on the Brown Spot disease of paddy (*Helminthosporium Oryzae Br. de Hann*) at Mudón, possibly because the disease was mild in intensity. It was again noticed at Kanbalu that the disease was worse in fields which were short of water. A species of *Anguillulina* has been found to be associated with the disease known as "*Akhet-hpet*" in parts of Tavoy and the Delta. Both living and dead nematodes have been found on the grain. It is therefore necessary to try heat and chemical treatment on the seed. "*Ufra*", another nematode disease of paddy is fairly widespread in the Delta and appears to be spreading. Abdominal spotting of rice was investigated in co-operation with the Entomologist. Jassids are not responsible for the disease. Luthra's method of controlling smut of *pyaung* by exposing the seed to the sun after soaking in water was under trial and incidence of the disease was reduced by 50 per cent. Rust attack on wheat was very serious but was due to *Puccinia graminis Eriks.* Last year the rust was due to *Puccinia glumarum* but the latter was absent this year. Twenty-three rust free plants were found in a badly infected field in Kyauksè. These plants had matured early and whether they are truly immune or merely early has yet to be discovered. The *Taukkemi* disease of onions showed some response to spraying with 1/7000 copper sulphate solution. Higher concentrations will be tried this year. 0.5 per cent suspension of Ialine Colloidal Sulphur reduced the incidence of mildew disease of betel vine in Kyauksè by about 40 per cent. 634 (514) bottles of straw mushroom spawn were distributed during the year and many demonstrations of mushroom growing were given. Spawn isolated from Lower Burma mushrooms gave better results when grown in Lower Burma than did spawn from Mandalay. Manuring the beds

with powdered *pèsinngon* or gram gave earlier and better yields but cow dung, groundnut cake, lime and bonemeal were without effect. English mushrooms were not very successful in Mandalay but gave good results in Maymyo. Experiments with the green muscardine fungus to control rhinoceros beetle were carried out at Madaya in co-operation with the Entomologist but results were inconclusive.

Entomology.—The Entomologist conducted field experiments on the *kyetthun* disease of paddy at Kawlin, Gyodaung and Meza in co-operation with the Deputy Director of Agriculture, Northern Circle, Mandalay. Sulphate of Ammonia and Nicifos No. 2 were applied but showed no tendency to control the disease. At Mahlaing, an experiment with a randomized layout was carried out to discover the relationship between incidence of the Cotton Stem Weevil (*Pemphcres affinis Fst*) and yield of lint. No conclusive results could be drawn. Co-operative work between the Entomologist and Mycologist on the brown spot disease of paddy and on the green muscardine fungus to control rhinoceros beetle has already been referred to. In the search for *pèsinngon* resistant to bruchid beetle attack, the Entomologist has obtained several strains ordinarily showing less than 2 per cent attack. Unfortunately, such immunity appears to be associated with undesirable colour of seed coat and, on the whole, bruchid attack seems to be largely a matter of chance rather than a heritable character.

Sericulture.—Twenty-three students were trained in rearing and reeling at various stations. At Maymyo, clones were established for grafted mulberry. A mild attack of *Grasserie* occurred at Kalama during February to March, muscardine occurred at Maymyo and Leiktho while at Leiktho, Thagweplo and Kalama, the parasitic fly, *Tricolyga sorbillans, Wied* was reported. Rearing and reeling demonstrations were carried out as usual at Mandalay, Maymyo, Rangoon, Prome, Taungdwingyi, Shwedaung and Shwebandaw. Five acres of mulberry were started up at Bilin, Thatôn District, with departmental assistance. The total distribution of seed cocoons and layings was about the same as last year. The absence of a tendency to expand is stated by the Entomologist to be due to the delicate nature of the Burma Hybrid silk-worms under distribution and to the fact that no premium is given for the improved silk from the hybrid worms. Selection work on indigenous worms to see if varieties yielding as well as the hybrid can be obtained, while still retaining the robust nature of the indigenous silk-worms, is to be carried out.

Rice Research.—At Hmawbi the Rice Research Officer had 369 hybrid cultures under observation and 69 cultures of crosses were sufficiently advanced to be under yield test. Among the more advanced cultures, the following are of interest :—

XcF$_{11}$ ***(Honduras × Emata A16-34).*****—Most of these cultures are of *Ngasein* and Japan types and have hard and translucent grain. The Japan type cultures are yielding better than A16-34 and *Midon* D17-88.**

XfF_{11} (Fortuna × Emata A16-34).—These include many large bright *Ngasein* types which are very vigorous in the field. Two of the cultures have given good results in yield tests both at Hmawbi and in the districts.

XkF_{11} (Aikokku × Midon D17-88).—Certain Japan type cultures of this cross, although yielding as well as the parent D17-88, were not very vigorous in the field. They have now been back crossed on to D17-88 with resultant improvement in vigour.

XaF_{12} (Ngasein C19-26 × Ngasein C15-10).—These cultures include Xa-97 and Xa-108 which are already under distribution. This season XaF_{11}-197 has outyielded Xa-97, formerly regarded as the best of the series.

There are many other interesting hybrids, some of which are still segregating for various characters. Hybrids from Mandalay and Akyab are also under experiment and also exotics from Siam, Java, Formosa, the Philippines, Nyasaland, America, Union of Soviet Socialist Republics, Bengal and Bombay. Work on genetics was continued and confirmed the earlier findings that sterility is governed by interaction of many complex factors but can be largely eliminated by vigorous selection for five to six years subsequent to the F_2 generation. Study of size and shape of grain character has been continued as far as the F_5 generation in which segregation for length and breadth of grain was still proceeding. A study was made of the root systems of the well established varieties *Emata* A28-6, *Ngasein* C15-10 and *Ngasein* C19-26. No very marked differences were found. With the exception of C15-10, however, the root system tended to be deeper when broadcast than when transplanted. An interesting study of Photoperiodism was carried out, using the pure lines *Ematas* A31-12, A28-6 and *Ngasein* C15-10. By reducing the number of hours of daylight to which the plants were exposed to 8 or 10 hours daily, life periods were reduced by between 40 and 100 days approximately. This may explain why sub-tropical varieties of paddy do not suit Lower Burma. Such sub-tropical paddies when grown at Hmawbi mature in 90-100 days and usually show abnormal growth. The method gives the plant breeder a useful means of making paddy flower at a particular time for crossing purposes. A further study of quality as affected by date of harvesting confirmed earlier results. In general, harvesting 30 days after flowering, combined with shade drying seems generally suitable. Field work included 9 yield tests comprising 87 strains at Hmawbi and two yield tests comprising 16 strains at each of 18 district centres.

In the horticultural Section most Indian varieties of Mango have been found unsuitable. Alfonso, Pyri, Langra and Malda Khas produced good fruit but do not produce regularly. Stem borer is serious and nothing but severe pruning has proved of use. Application of bonemeal and potassium sulphate had no effect on fruiting. Prome,

Shan and Nagpur oranges did not bear while Jaffas from Mudôn died. Australian grape fruit gave better quality fruits than Duncan. The better varieties of Pomelo are not yet fruiting. Sapotas continued to be the best paying garden crop, the gross returns being Rs. 86-11-0 per acre. Grafts are in keen demand. Litchis as usual gave abundant vegetative growth and a few poor quality fruits were obtained for the first time. African Oil Palm and Tung (Montana) have proved definitely unsuited to Hmawbi conditions. Sale proceeds from the fruit garden improved to Rs. 738-2-0 (Rs. 676-6-6)

Myaungmya.—Among the numerous paddy varieties under test, *Ngasein* C33-18, C33-24 and C30-32 are outstanding. At present Xa36-44 is the best hybrid. Seventeen paddy strains were under multiplication and there were nine manurial and one cultural experiments. The latter comprised a further test of broadcasting *versus* transplanting with and without manuring. Broadcasting with 80 lbs. per acre of Nicifos No. 2 gave the best result both for yield and profit. Experiments to discover the best method of applying nitrogen and phosphate were continued. A test of the relative efficiency of nitrogen applied as ammonium sulphate or as sodium nitrate showed the former to be superior whether additional phosphate was applied or not.

In the horticultural section the main work has been the production and sale of grafts of the best mangoes. Three litchi trees are now flowering for the first time. Application of ammonium phosphate at 2, 4 and 6 lbs. per tree, according to size, has considerably improved the citrus plants. Chinese and Mammoth pomeloes are of poor quality and will be removed when better are available. Grape fruit does not suit local conditions. Sapotas are doing well and African Oil Palm has improved now that the rhinoceros beetle is under control. Kew pineapples fruited well in spite of receiving no irrigation. A surface mulch was carefully maintained during the dry season. Soy beans hold out no promise of suiting Myaungmya conditions.

Mudôn.—In paddy varietal work *Emata* A35-17 has now outyielded the standard strain under distribution, *Emata* A29-3, both in yield and rice outturn. No strain has been found to beat *Ngasein* C28-16, while the standard strain *Byat* E30-42 is still the best of its type. In a spacing experiment, a planting distance of 6″ × 6″ has been found the best. Application of Nicifos No. 2 at 100 lbs. per acre to nurseries has given good results.

In the work on upland crops, better yields have been obtained from African Oil Palm as a result of keeping a watch-boy to scare away birds. A yield of marketable pericarp oil of 355 (130) lbs. per acre was obtained. According to laboratory tests, the yield of kernel oil is 49 lbs. per acre. Fairly good qualities of pomelo and grape fruit have now been obtained. Twenty acres of the new mangosteen orchard have been planted up. Sapotas are doing well. Avocado pears fruited well but shed many

immature fruits during the monsoon. Litchis have not yet fruited. Kew and Mauritius pineapples did well but Queen pineapple did not withstand the hot season as well as the two former varieties. Cinnamon (*Cinnamomum zeylanicum*) bore profusely and seedlings have been raised for sale. Coffee (*Robusta*) is bearing well and is free from serious disease. Arrowroot was grown experimentally over one acre in the mangosteen orchard and the cost of production was found to be Re. 0-4-6 per lb. The yield of starch was only 9·15 per cent of the yield of tubers At such costs, production is not profitable and growth should be confined to more suitable soils Sixty mangosteen grafts on *speciosa* stock were made. Fifty-two gave a successful union but there were 50 per cent casualties. Grafts of mango and sapota were produced by inarching the former on "sinnin" stock and the latter on Sapota and Mimusop kaukii. The Sapota grafts on Mimusop kaukii gave the better results. Attempts to bud Sapota failed. Budding experiments with Jaffa orange, Singapore pomeloes and Australian grape fruit on stock of Colombo and Malta limes were continued. In every case the Colombo limes proved superior. Experiments on root growth and vegetative methods of propagation using Hortomone Auxim were carried out. Success was obtained with gooties of mango, orange, grape fruit, rambutan and durian but with cuttings of citrus, mangosteen and sapota no success was achieved.

Akyab.—*Ngasein* C31-849 gave the best results in a test of A and B type paddies. The standard variety *Ngasein* C23-6 was beaten by several varieties, especially C31-5791, while in the test of D types (*Midôn*) D32-4 gave the best result. Five yield trials were carried out on the central farm and several on the major farms. Hyganic fertilizer proved unsuitable for paddy in manurial trials.

A small horticultural section of 5·4 acres is maintained with mangoes, sapota, litchi, mangosteen, durian and oil palm. Although very small, this acts as a demonstration and has attracted a good deal of attention. The manurial work on the coconut plantation at Noakally was continued. As a result of manurial treatment, the proportion of bad nuts is being reduced annually but all are still of small size and the yield is not commercial. Cashew nuts have been interplanted in 8 of the 10 blocks during the year and are doing well, there being few casualties.

Pyinmana.—In two separate tests the Coimbatore cane Co.419 has outyielded the Java cane P.O.J.2878. In one test Co.419 gave 43 tons and in the other 46 tons per acre against 28 and 22 tons from P.O.J.2878. In manurial trials heavy doses of sulphate of ammonia up to 120 lbs. per acre were applied. Increased yields were obtained but these did not differ significantly in the case of the dressings at 80 and 100 lbs. per acre. Nicifos at 40 lbs. N per acre beat sulphate of ammonia and Hyganic, a bulky organic

fertilizer. This result is unusual as hitherto phosphatic manures on cane have given no significant results. Experiments on liming, spacing and time of planting were carried out as in previous years. In a ratoon experiment on good soil Co.419 yielded 49 tons as against 21 tons by P.O.J.2878. A second ratoon crop will be taken from these plots.

A small horticultural section is maintained with citrus, mango, guava, litchi, sapota and Kew pineapples. The Burmese mangoes are fruiting freely but the Alfonso only sparsely. Sapotas are also fruiting freely and the litchi has fruited but hitherto the fruits are few and small. At Tatkôn drought affected yields severely. Chinese soy beans were the best with 543 (788) lbs. per acre. The small seeded linseed, DACP was the best with 524 lbs. per acre. A small experiment with Harrison's Special and Adcock cigarette tobaccos was moderately successful, the prodnce being rackcured. Several varietal yield tests were carried out with *kauklat Ngaseins* and Xa hybrids at Pyu, Kyauktaga and Pa-aung-gwe Farms. On the average, Shan-nyein *Ngasein* C24-71 yielded the best but Xa hybrids were superior to local varieties.

Kanbalu.—An unusually good yield of paddy was obtained averaging 52 baskets per acre. Drought affected other crops. Amongst soy beans, Burmese gave the best result with 6·86 baskets per acre. *Pesinngon* C10 yielded 10·59 baskets and Pusa 51, 7·44 baskets per acre. The latter seems rather long lived for Kanbalu conditions. A spacing of 4′ × 4½′ seems best for *pesinngon* on this farm. The experiment on rotation of crops was continued. Work on *myitpo* disease of paddy was carried out at Ye-U and Chiba. The disease was of slight intensity only. *Kyetthun* or onion leaf disease of paddy was under investigation in co-operation with the Entomolgist. Application of fertilizers gave no useful results.

Mahlaing.—Mahlaing Cotton No. 3 has now entirely replaced Mahlaing No. 2 on the farm, on the first year distribution and on part of the second year distribution outside the farm. There are now 5,605 acres under this cotton, not including that on the Mahlaing Farm. Farm yields were 585·32 (500) lbs. per acre of seed cotton in spite of the poor year. This yield may be compared with the Meiktila District figure of 163 (211) lbs. Ginning outturn was satisfactory at 39·80 (39·32). Mahlaing No. 4 was selfed over 6·29 (2) acres of the better class soil and gave 873·97 (1227) lbs per acre. Two hnndred and eighty bales of Mahlaing No. 3 and 57 bales of Mahlaing No. 4 were sent to the United Kingdom for sale. Mahlaing No. 3 realised Rs. 24 per 100 viss of kappas against the local price of Rs. 20. Further promising cotton hybrids are coming forward. In manurial work on cotton, nitrogen has been found necessary but it is not certain whether phosphate is required or not in addition. In the rotation experiment, application of Farm Yard

Manure gave good increases on early sesamum and beans. Green manuring depressed the yield of sesamum. Work on *pèsinngon* included the Economic Botanist's breeding work. Mahlaing Green Pods gave the best and New Era the poorest yield. *Kalapyaung* and five other *pyaung* varieties have now been found to be very resistant to Striga lutea disease. The two types of seed-drill evolved last year have emerged very successfully from field scale tests.

Allanmyo.—Twenty-seven cotton hybrids were under trial. Over a 4-year period 29/44 and 29/14 have come out first in yield and ginning per cent. Yield trials of *wagyi* and *waga'e* strains gave no significant results. Amongst sesamums, M30-17, M30-13 and M33-569 are outstanding. The erect groundnuts A.H.2 and A.H.32 from Madras gave good results. Among the spreading varieties, Virginia Running, Akola, Big Japan, Bold Chinese North and Ilorin gave better results than last year. For the Burmese types a spacing of $1\frac{1}{2}' \times 9''$ was best. A small horticultural garden is maintained at Allanmyo with mango, orange, pomelo, lime, grape fruit, Kew pineapple and papaya. Thirty-one mangoes are now fruiting freely. Nine Prome orange trees planted ten years ago have fruited for the first time and gave fruits of average quality.

Paddy work is conducted at Pwinbyu where Myaungmya C31-13 did well but did not yield so well as the standard variety *Ngasein* C15-10. C15-10 also exceeded the yield of Xa hybrids, *Ngasein* C33-6 and *Byat* E32-16. In a test of *Midôn* strains none exceeded the yield of the local variety. *Emata* A28-6 and A28-8 yielded better than the local varieties in tests at Kama in Thayetmyo District. A28-8 is becoming popular in Kama and Thanbulla.

College Farm, Mandalay.—Owing to the re-opening of the Agricultural College, Mandalay, experimental work was necessarily curtailed but the permanent manurial series was carried out as usual and a test of the relative efficiency on paddy of sulphate of ammonia and sodium nitrate in the presence and absence of super-phosphate was carried out. The advantage was with sulphate of ammonia in every case. Cultivation of onion bulbs on 0·09 acre was carried out in the paddy stubbles after harvest. Produce valued at Rs. 83-5-0 was obtained at a cost of Rs. 50. The depressed patches in the paddy crop which have been referred to in the reports for several years appear annually at approximately the same places. Application of gypsum removed the symptoms in about five days.

Markets Section.—Thirty surveys have been submitted to the Marketing Adviser and with the gradual completion of the All-India programme, only one new survey, Palm Jaggery, was completed during the year. Certain surveys due for submission in 1939-40 were commenced while surveys of locally important crops such as betel nut, chillies, tea and *thanat-phet*, which are not on the All-India schedule,

have also been commenced. Increasing use is being made of the services of the Markets Section by various Departments of Government for information which is not otherwise easily available. The Provincial Marketing Officer, Burma, has been appointed Secretary of the newly formed Burma Cotton Committee. A long range programme of development work has been prepared involving the standardization of weights and measures and improvement of trading practices by establishment of regulated markets on the Berar pattern; the introduction of grade standards by means of a National Mark Scheme working under a grading act and the provision of licensed warehouses where goods can be stored under impartial third parties to reduce trading risks and thereby cheapen credit. Of more immediate interest is the preliminary development work which commenced in December 1938. Work has been commenced at Kayan (Hanthawaddy), Magwe and Shwebandaw (Thayetmyo) in connection with the marketing of paddy, groundnuts and *wagyi* cotton respectively. The three Assistant Marketing Officers have toured these areas, conducting propaganda to accustom buyers and sellers to ideas of standardization and to encourage the formation of local societies to carry these ideas into effect by setting up "True Weights and Measures Committees". The object is that such committees will, after they have gained sufficient experience, be able to take over the running of regulated markets. At Kayan, which is a natural assembly point for sale of paddy, a Markets Section stall, equipped with standard weights and measures and apparatus for testing, was opened in mid-February 1939. Direct weighments were carried out on request on any paddy brought to the stall. An average of 3,000 baskets of paddy per week was sold under its supervision and 17 measuring baskets and 70 spring balances were brought in for check and adjustment. Magwe is a natural assembly point for sale of groundnuts, and preliminary work regarding standardization has been carried out there for a considerable period. More recently, representatives of 102 villages formed the Magwe Taungthugyi Association. Representatives of this association formulated their demands to buyers who then formed a brokers' association. After holding independent meetings, a conjoint meeting was held and the "Magwe Marketing Committee", with representations of both interests was set up and has functioned actively since September 1938. A sub-committee was formed to check weights and measures. Twenty-seven platform weighing machines have been checked and adjusted and a groundnut basket holding 40 lbs. F.A.Q. groundnuts standardized for use in the early part of the season when the nuts are sold by volume. Forty such standard baskets have been made and checked while 50 more have been ordered by village societies. In Shwebandaw it has been the custom to take 110 viss and at Thanbulla 120 viss instead of 100 viss when buying kapas. At assembly points, weighing by a "sin", a wooden copy of the steel-

yard was customary while spring balances were used in jungle weighings in Shwebandaw area. Both types of device were found to favour the trader on account of misadjustment. A "Shwebandaw and Thanbulla True Weights and Measures Committee" was constituted on the lines followed in Magwe and this society has been functioning since 21st February 1939. The use of the "Ya-su" or wooden beam balance, utilizing weights certified by the Rangoon Corporation workshops and re-stamped with the seal of the committee is being actively pushed. Sixty-one "sins" have been surrendered in the villages around Thanbulla and 20 "Ya-su" with 227 standardized weights have been supplied to cultivators and traders.

6. Demonstration and propaganda is carried out by means of an allotment which during the year was increased to Rs. 33,400 (Rs. 24,000). This allotment allowed of an increase in the number of demonstrations to 12,557 (6,419). As recently as three years ago, allotments were only sufficient to carry out about 2,000 demonstrations per annum. In Lower Burma most of the demonstrations take the form of paddy varietal and manurial demonstrations, mostly on nurseries, and the use of *Theikpan* ploughs. The opportunity to work with crops other than paddy is limited but on *kaing* land such as is found in the Salween and Ataran riverine areas, many demonstrations of Imperial Spanish Groundnuts have been carried out while the growing of *mat-pe* after paddy has also been demonstrated on silty soils which do not bake too hard in the dry season. English vegetables and mushrooms have also been demonstrated on a fairly large scale. Upper Burma offers more variety in the work of demonstration. Such work consists in the introduction of new crops or of new varieties, improved storage of Farm Yard Manure, line and square sowing, mixed cropping, chiefly *pesinngon* with sesamum or groundnuts, the use of intercultivating implements, control of smut on jowar, etc. In Toungoo District, manurials on sugarcane have been demonstrated in large numbers, together with line sowing of this crop. A special feature has been made of demonstrating the ratooning ability of P.O.J.2878, as it is considered that the successful ratooning of sugarcane is the most important method of reducing cultivation expenses. In the case of the Myingyan Circle, special demonstrations are carried out with funds derived from the Cotton Cess Fund. The unit of improvement is the demonstration holding. During the year there were 30 (31) centres and 87 (87) holdings, each centre being in charge of a Demonstrator. There were also some hundreds of demonstration plots outside the actual holdings. The object of the work is to encourage the line sowing of cotton land its rotational crops with intercultivation, the layout of plots in such manner as to minimise erosion, the proper conservation of Farm Yard Manure and improved tillage with *Theikpan* ploughs. The methods are being adopted in

new areas and although there is still some suspicion, especially where a settlement is in progress as in Myingyan, cultivators now beg of the Department to come and assist whereas a few years ago it was difficult even to get land for demonstration purposes.

The holding of Agricultural Shows has only been recently re-introduced after a complete cessation during the depression. During the year under review, the holding of major shows at many places had to be cancelled owing to disturbances, with the result that the number of such large shows diminished to 8 (12). 52 (45) Agricultural exhibits were arranged at pagoda festivals and on other suitable occasions.

7. Evidence of the effectiveness of demonstration work is shown by the distribution of improved seed and implements. Owing to the destructive rains of December 1937, a portion or the whole of the produce of certain farms was rendered unfit for distribution for seed purposes. Further, on many of the departmental farms in Lower Burma, stocks were held for the use of Deputy Commissioners in case of shortage of seed supply and these stocks were not released until it was too late in the season for utilization for seed purposes. It was therefore thought that there would be a very considerable reduction in seed distribution in 1938-39. In certain areas a reduction has occurred, but the total amount of seed distributed during the year shows a slight increase over that of the previous year. Paddy to the extent of 199 (189), cotton 2'50 (3'72), groundnuts 3'41 (3'31), sesamum 0'49 (0'25), beans 1'00 (1'17), gram 1'45 (0'95), wheat 0'24 (0'11), millet 0'47 (0'48) and miscellaneous 0'66 (0'34) lakh pounds were distributed. On the whole, this result may be considered as unexpectedly good. Distribution of grafts, seedlings, etc., of horticultural crops also showed a considerable increase during the year. A steady increase is now to be expected as the horticultural areas are just beginning to have superior stocks available. The distribution of improved ploughshares shows a slight decrease but this is not a serious matter because village blacksmiths are now manufacturing *Theikpan* shares in many districts and are selling them independently. Sale of plough-bodies practically doubled while imported intercultivators showed a slight increase. These intercultivators are mostly Planet Juniors, selling at about Rs. 20 each. Many more could be sold if more credit could be given. As usual, lists showing details where improved paddies were available in quantity were supplied to Chambers of Commerce and the larger rice firms. Altogether the lists covered 101'2 lakhs of baskets among which were 36'0 *Emata*s, 27'5 *Ngasein*s and 17'4 *Midôn*s. The lists also included 3'4 lakh baskets of the Xa type hybrids. These lists, of course, refer only to Lower Burma. In many areas in Upper Burma, especially irrigated areas, departmental varieties have become the standard but since these are not generally exported, lists are not compiled.

Demonstration of the value of fertilizers is resulting in a gradual increase in their use. The total sale of artificials was 1,020·1 (740·4) tons while 790 (828) tons of bonemeal were also used as fertilizer.

8. Distribution of improved seeds, implements and fertilizers is financed through a special Seed and Implement Advance Account. During the year Rs. 1,78,108 (Rs. 1,57,415) was drawn from treasuries and Rs. 1,66,493 (Rs. 1,71,058) credited, a net profit of Rs. 11,207 (Rs. 4,133) being made.

The seed referred to above is chiefly pure varieties of paddy which after preliminary multiplication on Central Experimental Farms is multiplied on the major farms which in turn seed the minor farms. Major and minor farms are worked by tenants on lease. During the year there were altogether 25 (24) major farms totalling 2,900 (2,850) acres and 206 (194) minor farms totalling 11,818 (11,498) acres. Rents of major seed farms realized were Rs. 20,382 (Rs. 15,308) and minor seed farms Rs. 48,116 (Rs. 38,922). Outstandings on 31st March 1939 amounted to Rs. 500 (Rs. 4,100) for major farms and Rs. 1,619 (Rs. 2,668) for minor farms. The relatively high outstandings in the previous year were due to extensive damage by the December 1937 rains.

In the previous report the inadequacy of the major farms in certain areas and the lack of godowns were referred to. These conditions remain unchanged but sanction has been received to proceed with acquisition of certain major farms and provision of several godowns. More than any other single factor, godown accommodation determines the amount of pure seed which can be distributed departmentally. When such accommodation is not available either on the farms or on payment of rent, pure seed cannot be stored for seed purposes on Seed and Implement Advance Account as its safety could not be ensured. Relatively small amounts can be sold for seed purposes immediately after harvest and hence much of the crops on major farms without godowns cannot at present be used for seed purposes.

9. No direct dealings were made with Co-operative Societies although there were many transactions with individual members of such societies. The Government Estates, North Sittang Colony bought 872 baskets of Xa97, 15 of *Shan-nyein* C24-71 and 9 of *Ngasein* C14-8, harvesting a crop of 42,690 baskets. The South Sittang Colony bought 1,426 baskets of Xa97 and *Midôn* D17-88 for seed purposes. In the West Central Circle, Kyigan, Myaing, Lingadaw and Yesagyo-kyu Agricultural Societies were helpful in demonstration and propaganda work in Pakôkku District and the Tawzeik and Minhla Agricultural Societies in Minbu and Thayetmyo Districts. The latter especially assisted in the distribution of C.10 *pèsingon*. Assistance was rendered [illegible] Agricultural Society in the distribution of *Emata* A28

paddy. The Magwe Taungthugyi Association and the "True Weights and Measures Associations", Magwe and Shwebandaw have already been referred to in the work on marketing.

10. It is sometimes desirable to form an estimate of the cash value of the work the Agricultural Department is doing. This is a matter of extreme difficulty but an attempt has been made in the case of the 1937 crops. Departmental work has been classified under four heads, the benefits to the cultivator being assessed separately under each, with the following results :—

		Rs.
1. Improved varieties	... ...	59,27,386
2. Improved methods of cultivation	...	27,42,614
3. Use of fertilizers	... ...	2,07,303
4. Improved implements	... ...	3,81,174
Total	...	92,58,477

In many cases it is difficult to follow the spread of improved varieties of crops unless these are easily distinguishable in the field and in any case departmental staff is insufficient to obtain complete details. The staff of the Land Records Department has, however, rendered considerable assistance in determining the areas over which improved varieties have been adopted. Cases where spread of improved varieties is easy to follow may be instanced in *Theikpan Hnannet (Pyigyi)*. This is quite different in seed colour and full branching habit from the varieties formerly grown in the West Central Circle. C10 and New Era *pesinngon* are also very easily recognised as are sugarcanes introduced by the department, after a little practice. In calculating the value of the above services, it has been assumed that after a lapse of three years subsequent to distribution, departmental paddies lose their claim to be regarded as "improved" varieties, although, generally speaking, deterioration is not so rapid. Premia for improved varieties are by no means universal but cuts are often imposed for poor quality which departmental selections escape. Hence, in calculating benefits derived by growing improved varieties, it is necessary to assess separately the values for premia and for increased yields.

Benefits due to improved methods of cultivation consist in introduction of double cropping where only one crop was previously taken, *e.g*, sesamum before paddy and *mal-pe* or gram after paddy and in the saving of seed and reduction of cultivation expenses consequent upon line or square sowing compared with broadcasting. Claims for increased yields are not made under this head although line sown crops are much more secure in bad years than broadcasted crops.

In the case of benefits due to use of fertilizers, these are calculated from increased yields actually obtained less the cost of fertilizer applied while in the case of improved implements the value has been

determined from the increased area which can be cultivated or intercultivated in a given time. In certain cases the use of implements reduces weeding costs but care has been taken not to reckon such savings twice, *i.e.*, under improved methods of cultivation as well as under improved implements. Brief details showing how the value to the cultivator has been calculated are shown below.

——	Increased yield.		Premia obtained.		Total cash value to cultivator.
	Acreage affected.	Cash value in rupees.	Acreage affected.	Cash value in rupees.	Rs.
I Improved varieties—					
1. Paddy ...	858,837	30,63,836	678,476	8,84,821	39,48,657
2. Sugarcane	24,195	9,68,275	...	...	9,68,275
3. Gram ...	165,930	1,72,662	...	...	1,72,662
4. Groundnut	25,932	2,09,175	23,105	30,420	2,39,595
5. Sesamum	41,656	1,00,255	376	94	1,00,349
6. Cotton ...	584	4,088	4,660	9,320	13,408
7. *Pèsinngon*	91,914	3,91,720	2,500	5,625	3,97,345
8. Beans ...	2,299	18,041	12,811	20,899	38,940
9. Other crops	9,833	47,530	500	625	48,155
Total ...	1,221,180	49,75,582	722,428	9,51,804	59,27,386
II. Improved methods of cultivation–					
1. Winter cultivation.	21,379	...	...	...	45,406
2. Line sowing	265,978	...	...	...	18,63,454
3. Square sowing.	28,573	...	...	...	3,38,476
4. Inter cropping.	26,610	...	...	...	1,89,670
5. *Matpè* after paddy.	10,000	...	...	...	1,80,000
6. Improved implements.	8,765	...	...	...	52,590
7. Anti-erosion layout.	14,138	...	...	...	14,138
8. Sesamum before paddy.	5,675	...	...	...	56,750
9. Miscellaneous.	426	...	...	...	2,130
					27,42,614
III. Use of fertilizers.	75,670	...	...	...	2,07,303
IV. Improved implements.	478,442	...	...	...	3,81,174
Total ...	...	...	...	...	92,58,477

The values claimed vary from district to district according to local conditions, variation in yields, etc. It is realized that specific items are susceptible of criticism but in general, a conservative estimate has been made. Further, certain claims which might have been justifiably included, have been leftout of account. Two such may be instanced It is well known that the paddy crop in Arakan a few years ago sold at Rs. 5 per 100 baskets lower than in Rangoon because of serious admixture with red grain and general poor quality. Owing to the general grading up in the course of time by improved paddies distributed by the Agricultural Department, the general level of the crop has been so improved that for some years this paddy has sold at Rangoon parity. As this applies to the whole exportable surplus, an additional Rs. 15 lakhs per annum must be finding its way into the pockets of the Akyab cultivator. This claim has the support of the leading rice millers in Akyab and is by no means an unsupported claim. The second instance concerns the gram crop which twenty years ago was in danger of complete extinction because of a Fusarium Wilt disease. Fortunately, the Agricultural Department discovered an immune variety which was distributed on a wide scale with the result that the crop has actually increased instead of being wiped out. The value of this single introduction must have been worth several lakhs, of rupees per annum. As the introduction occurred so long ago however, no claim has been made. Hence, even if specific details of the various claims are not above criticism, it is contended that the total benefit of Rs. 92½ lakhs which is claimed against a net expenditure of about Rs. 9 lakhs, does not err on the high side.

11. As in previous years the Department has received a great deal of assistance from district officers in the various Circles, from the Chambers of Commerce and from many individual firms. This valuable assistance I gratefully acknowledge. In particular, the assistance of the Chambers of Commerce in appraising the commercial value of paddies evolved by this Department and in giving advice in many important matters is invaluable. The continued co-operation of the commercial community is of the utmost importance to the well-being of the Agricultural Department. Without this co-operation, much of the work done by the Department would be futile. To the staff of the Department and to my office staff my thanks are no less due. The lot of the district staff has been particularly difficult on account of inadequate numbers, a difficulty which they have spared no efforts to overcome.

J. CHARLTON,

Rangoon, the 28th June 1939. *Director of Agriculture, Burma.*

PART II.

Reports of Departmental Officers.

Annual Report of the Principal, Agricultural College and Research Institute, Burma, Mandalay, for the year ending the 31st March 1939.

INTRODUCTORY.

The most important event of the year was the recognition of the College as a constituent College of the University of Rangoon. This followed negotiations in the previous year and was in accordance with the recommendation of a Joint Committee of the Council and Senate of the University. This recognition took effect from the 16th of June 1938 from which date a two years' course leading to the degree of Bachelor of Science in Agriculture was instituted. The Government of Burma subsequently announced that this degree would be considered a suitable qualification to admit candidates to the open competitive examination for entry to a number of the Subordinate Civil Services.

When the College opened for teaching on the 16th June only one Professorship, namely, that in Agriculture was instituted.

ADMINISTRATION.

Mr. D. Rhind, B.Sc., I.A.S., was in charge as Principal of the College from the beginning of the year to the 5th May when

Mr. A. McLean, B.Sc., I A.S., was appointed to this post.

Mr. A. McLean, was appointed Professor of Agriculture on the 16th June when the academic year began. Mr. McLean held these posts until the close of the year.

Mr. D. Rhind was in charge of the Botanical Section as Economic Botanist until the 6th October when he proceeded on leave to the United Kingdom. Assistant Director of Agriculture U Ba Thein, B.A.S. II, Research Assistant in Botany, was appointed to officiate in Mr. Rhind's place and held this post until the end of the year. U Ba Thein was replaced as Research Assistant by U Tin, B.A.A.S. U Tin was on leave with medical certificate for eleven days from 8th June 1938. Two new appointments were made in this Section on a temporary basis for a period of two years, namely :—

(1) Dr. S. C. Varma, M.Sc., Ph.D., B.A.S. II, Lecturer in Agricultural Botany, from 18th June.

(2) Mr. N. P. Chowdhury, M.Sc., Demonstrator in Agricultural Botany, from 15th June.

U San Maung, B.A.A.S., from the West Central Circle was attached to this section from 1st to 30th April 1938 and from 1st February to 31st March 1939 in connection with research work in cigarette tobacco curing in Burma.

Dr. A. T. Sen, M.Sc., Ph.D., A.I.C., was in charge of the Chemical Section as Agricultural Chemist throughout the year.

Mr. M. M. Menon, B.A.A.S., went on deputation to Rangoon University for training in statistical work from 15th June to 6th October.

Assistant Director of Agriculture U Po Shin, A.T.M., B.A.S. II, Research Assistant in Chemistry, who had been on leave from 1st April to 14th June proceeded on leave on 3rd January 1939 for sixteen days and retired at the end of that period. Mr. Menon was promoted to the vacancy caused by U Po Shin's retirement. Mr. Menon was replaced by an outsider U Ko Ko Gyi, B.Sc., who was appointed for a period of two years on probation on the B.A A.S. cadre and joined the College on 24th March 1939.

In the Agricultural Section Assistant Director of Agriculture U Ba Tin, B.A.S. II, was appointed Lecturer from the 1st May 1938. This officer had held hitherto the post of Officer in Charge of the College Farm, a post which was replaced by the Professor of Agriculture.

Mr. H. C. D. Pal, B.Sc., B.A.A.S., was appointed Assistant Lecturer in Agriculture from 9th May 1938. Mr. Pal was on leave with medical certificate for twenty-one days from 28th May and he resigned from the Department from the 21st November and his duties were then discharged by U Ba Sein (2), B.A.A.S., in addition to his work as Assistant on the College Farm.

U Thet Su, B.Ag., D.I.C., B.A.S. I., held charge of the Mycological Section for the month of April at the end of which he was transferred to District work and replaced by Dr. L. N. Seth, B.Sc., Ph.D., D.I.C., B.A.A.S., who was promoted to the B.A.S. II cadre with effect from the 20th May. Mr. Rhind was in charge of this Section from the 30th April to the 19th May. Dr. Seth then held charge throughout the year.

U Khin Maung, B.A.A.S., Assistant in this Section, was on leave for twenty-four days from the 12th September.

Mr. A. Ba Te, Officiating in the B.A.S. II as Entomologist held charge of the Entomological and Sericultural Sections throughout the year.

Mr. R. D. Mitra, M.Sc., was appointed as a Demonstrator in Entomology in the B.A A.S. on a temporary basis for a period of two years from the 15th June.

Assistant Director of Agriculture U Po Shin, B.A.S. II, on return from leave in June resumed his additional duty as Warden of the Students' Hostel. On his retiral in January he was replaced as Warden by U Ba Tin, B.A.S. II. U Po Shin's long service in this Department is noteworthy. He held the post of Hostel Warden to the satisfaction of all concerned. He takes with him into retirement the good wishes of all connected with the College.

Dr. A. R. Soni, Sub-Assistant Surgeon attached to the Military Police Battalion in Mandalay, was appointed as part-time medical attendant to the Students' Hostel from the 16th June.

In the Principal's office two additional clerks on the ordinary time scale were recruited on a temporary basis for a period of two years from 8th June and 10th June respectively.

EDUCATION.

The standard prescribed for the entrance qualification for the two years' course leading to the degree in Agriculture is a pass in the Intermediate Science Examination of Rangoon University with English, Burmese, Mathematics, Physics and Chemistry. The subjects prescribed for the degree course are Agriculture, Agricultural Botany, Agricultural Chemistry, Entomology and Sericulture, Mycology and

Twenty-four students were enrolled and commenced the course on the 16th June. To fifteen of those who were chosen at a selection board in Rangoon on the 30th May 1938 stipends of forty rupees per mensem were awarded by the Government of Burma. Two students from the Shan States received similar stipends from the Government of the Federated Shan States.

A few days after the course began one stipendiary student left giving the reason that he had scruples about the destruction of insects. He was at once replaced by a student on the short waiting list which had been prepared. One private student left without explanation towards the end of September.

Twenty-three students completed the course and all took the first degree examination, *viz.*, that in Entomology and Sericulture, on the 6th and 7th March 1939. Twenty-one passed and two failed. As a result of the September and March Terminal examinations the College Council recommended that of the twenty-three students who sat for them, four should not be promoted to the second year and should forfeit their stipends.

It may be of interest to record the districts from which the students have been recruited :—

District.	*Number of Students.*
Mandalay	5
Rangoon	10
Amherst (Moulmein) ...	1
Henzada	4
Yamèthin	1
Hanthawaddy ...	1
Tharrawaddy	1
Toungoo	1
Prome	1
Magwe	1
Taunggyi (Shan States) ...	1
Total ...	24

ATTENDANCE AT LECTURES, HEALTH, ETC.

The attendances at classes and practical work were very satisfactory throughout the year. Details are given in Appendix XI.

No serious illness occurred in the Hostel and minor ailments were treated promptly by Dr. Soni.

The students appeared to find the course a heavy one but are to be complimented on their diligence, keenness, and good sense.

RESEARCH.

This is recorded separately in the reports of the Economic Botanist, the Agricultural Chemist, the Mycologist and the Entomologist. Rice crop experiments with fertilizers under the control of the Professor of Agriculture are recorded in the College Farm report.

STUDENTS' HOSTEL.

In addition to the Agricultural Students twenty Intermediate College Students were in residence in the Hostel throughout the greater part of the year.

The arrangements made with the Principal, Intermediate College, at the beginning of the year worked smoothly. Some rearrangement in the number of rooms will be necessary at the commencement of the next term but otherwise similar arrangements will be necessary to enable the Intermediate College to continue until new buildings have been provided for that institution.

STUDENTS' RECREATION.

A combined team from the two Colleges entered and played in the Upper Burma Athletic Association Football League in 1938. Occasional matches were played on the College ground and on grounds of schools in the town. A successful general sports meeting was organized on the 4th of February. It is hoped to make this an annual fixture.

STUDENTS' EXCURSIONS.

A varied programme of Saturday morning excursions was organized from the beginning of November 1938. These excursions covered geological, agricultural, horticultural, industrial and technical interests in the vicinity of Mandalay and the surrounding districts.

MISCELLANEOUS.

(a) *Gas Plant.*—The expenses in connection with the running of this plant during 1938-39 were :—

	Rs.	A.	P.
1. Gas made 39,150 cubic feet		...	
2. Kerosene bought, 480 gallons	361	14	0
3. Kerosene from last year's stock, 28 gallons ...		...	
4. Total kerosene used 508 gallons		...	
5. Coal purchased, 2 tons	55	8	0
6. Spare parts and repairs	293	8	3
7. Miscellaneous expenses, soap, cotton waste, etc ...	7	10	0
8. Cost of labour	960	0	0
Total ...	1,678	8	3

The cost of making 1,000 cubic feet of gas amounted to Rs. 42-13-0 as compared with Rs. 30-7-0 in 1937-38. The production amounted to 77·1 (77·3) cubic feet of gas per gallon of kerosene. The increase in the cost of production of gas is partly due to the purchases of spare parts against none in the preceding year and partly to the lower amount of gas produced (39,150 cubic feet against 51,300 cubic feet of 1937-38) with the same cost of labour.

(b) *Buildings.*—The proposal to instal a water-borne sewage system in the College and in the Students' Hostel was revived during the year. The Sanitary Engineer visited the College and is now preparing plans for two separate installations for these two buildings.

Plans and estimates are being prepared for the installation of air conditioned cold storage chambers in the basement of the College. This will make possible investigation of problems of cold storage of fruit.

Library.—Librarian Maung Maung continued to be in charge throughout the year. 137 books, 152 bulletins, circulars, etc. were added during the year and 65 journals were received making a total of

354 books, bulletins and periodicals for the year. The Librarian has been engaged in preparing a new and up-to-date edition of the library catalogue. This is much needed.

Artist Photographer.—This officer was engaged in preparing negatives, photographic prints, maps, graphs, posters, etc., for the Specialists in the College and for Deputy Directors in Circles. He has prepared also two propaganda posters, lantern slides, etc.

A. McLEAN,
Principal, Agricultural College, Mandalay.

APPENDIX.

Statement showing the work done by the Artist Photographer during the year ending 31st March 1939.

For whom.	Negatives.	Prints.	Maps and Plans.	Graphs.	Showcards and Signboards.	Pen-drawing.	Lantern Slides.	Parsee Prartout Frames.	Posters.	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Economic Botanist, Burma ...	8	54	7	5	...	...	...	19	...	93
Mycologist, Burma ...	...	55	...	...	16	...	...	...	2	73
Agricultural Chemist, Burma ...	39	106	11	17	...	...	23	9	...	205
Entomologist, Burma ...	...	65	...	...	...	3	...	...	...	68
Principal, Agricultural College ...	4	92	...	...	2	...	...	...	...	98
Deputy Director of Agriculture, East Central Circle, Pyinmana.	...	3	...	...	...	...	..	...	...	3
Deputy Director of Agriculture, Myingyan Circle, Meiktila.	39	43	1	...	...	5	32	...	1	121
Provincial Marketing Officer, Burma.	...	66	...	...	...	...	...	...	...	66
Director of Veterinary Services ...	...	10	...	...	...	...	...	...	...	10
Total ...	90	494	19	22	18	8	55	28	3	737

Annual Report of the Agricultural Chemist, Burma, for the year ending the 31st March 1939.

I. Agricultural Education.

With the reopening of the Agricultural College, Mandalay, as a constituent College of the University of Rangoon teaching in agricultural chemistry was resumed from 16th June 1938. The standard of teaching is now that for the B.Sc. degree in Agriculture of the Rangoon University.

II. Analytical.

The following analyses were carried out in the laboratory during the year :—

	Number of analyses.
Beans	29
Soils	165
Oil seeds	107
Manures	33
Fodders	35
Paddy straw and grain	209
Miscellaneous materials	56
Total ...	634

The above includes Departmental work carried out for Deputy Directors and Specialist officers as well as work for other Government Departments and for members of the outside public.

III. Research.

(a) *Pot Experiment with* Myitpo *Soil.*

This experiment was carried out with *myitpo* soil from Ye-U Farm to compare the results with those obtained last year with *myitpo* soil from Kywezin.

The yields and composition of paddy are shown in Table I.

TABLE I.

Effect of Fertilizers on Yield and Composition of Paddy.

No. (1)	Treatment (2)	Oven dry. Yield per pot in gms. (average of five). (3)		Oven dry. Number of ears per pot. (4)	On oven dry material. Percentage of nitrogen. (5)		On oven dry material. Percentage of P_2O_5. (6)	
		Grain.	Straw.		Grain.	Straw.	Grain.	Straw.
1	No manure	15·0	19·0	5·0	1·098	0·354	0·678	·075
2	N_1 ...	22·0	21·0	8·5	1·178	0·444	0·563	·058
3	N_2 ...	22·5	20·3	10·5	1·158	0·385	0·550	·066

TABLE I—concld.

Effect of Fertilizers on Yield and Composition of Paddy—concld.

No. (1)	Treatment. (2)	Oven dry. Yield per pot in gms. (average of five). (3)		Number of ears per pot. (4)	On oven dry material. Percentage of nitrogen. (5)		Percentage of P_2O_5. (6)	
		Grain.	Straw.		Grain	Straw.	Grain.	Straw.
4	K_2 ...	16·0	18·5	6·0	1·074	0·367	0·588	·052
5	P_1 ...	15·5	18·0	5·5	1·098	·354	0·676	·075
6	P_2 ...	14·3	20·0	5·5	0·961	·386	0·637	·111
7	P_4 ...	18·3	28·5	7·5	0·948	·355	0·682	·171
8	N_1K_2 ...	19·3	24·0	8·0	1·161	·414	0·597	·173
9	N_2K_2 ...	14·5	21·5	5·0	0·997	·386	0·704	·199
10	N_1P_1 ...	26·0	24·8	13·0	1·006	·439	0·563	·061
11	N_1P_2 ...	21·3	29·5	10·5	0·974	·449	0·676	·108
12	N_1P_4 ...	23·5	30·8	11·0	1·014	·414	0·677	·151
13	N_2P_1 ...	23·0	26·3	12·0	1·093	·459	0·647	·088
14	N_2P_2 ...	34·8	40·0	15·5	0·937	·363	0·659	·121
15	N_2P_4 ...	41·8	45·0	17·5	0·928	·456	0·689	·180
16	K_2P_1 ...	22·0	23·8	10·5	1·007	·409	0·634	·108
17	K_2P_2 ...	19·0	22·0	8·5	1·018	·423	0·689	·182
18	K_2P_4 ...	15·5	24·8	8·0	1·003	·430	0·700	·167
19	$N_1K_2P_1$ ...	24·0	27·5	12·5	1·069	·455	0·598	·072
20	$N_1K_2P_2$ ...	29·3	34·3	14·0	0·961	·367	0·695	·163
21	$N_1K_2P_4$ ...	20·3	35·0	11·0	0·967	·367	0·666	·171
22	$N_2K_2P_1$ ...	28·0	33·0	12·5	1·062	·375	0·633	·071
23	$N_2K_2P_2$ ...	30·0	34·0	13·5	0·912	·46	0·666	·165
24	$N_2K_2P_4$ ...	34·0	42·0	15·5	1·002	·371	0·672	·199

N_1 and N_2 represent 40 lb. and 80 lb. N per acre respectively added as Ammonium sulphate.

K_2 represents 80 lb. K_2O per acre added as Potassium sulphate.

P_1, P_2 and P_4 represent 40 lb., 80 lb. and 160 lb. P_2O_5 per acre respectively added as Orthophosphoric acid.

It appears from the data in Table I that phosphate alone or in combination with potash has not given large yields in pot experiments with Ye-U soil whereas field experiments carried out at Ye-U

howed that phosphate gave good response whether applied singly or n combination. On the other hand the pot experiments show that when phosphate and nitrogen are given together in large doses very arge yields may be expected. The rearranged data in Table II bring out the facts clearly. Unfortunately paddy is a crop of low market value and hence from the stand point of profit the lowest rates, namely, 40 lb. of N and 40 lb. of P_2O_5 would seem to be the best. Similar results have been obtained from field experiments carried out at Ye U.

TABLE II.

Effect of Treatment on Yield of Paddy on Ye-U Soil.

Treatment. (1)	O (2)	N_1 (3)	N_2 (4)	K_2 (5)	N_1K_2 (6)	N_2K_4 (7)
Grain O ...	15·0	22·0	22·5	16·0	19·3	14·5
P_1 ...	15·5	26·0	23·0	22·0	24·0	28·0
P_2 ...	14·3	21·3	34·8	19·0	29·3	30·0
P_4 ...	18·3	23·5	41·8	15·5	20·3	34·0
Straw O ...	19·0	21·0	20·3	18·5	19·3	14·5
P_1 ...	18·0	24·8	26·3	23·8	27·5	33·0
P_2 ...	20·0	29·5	40·0	22·0	34·3	34·0
P_4 ...	28·5	30·8	45·0	24·8	35·0	42·0

The relative importance of a deficiency of any of the major elements may be seen in Table III.

TABLE III.

Effect of Deficiency of Major Elements on Yield.

Treatment.	Grain per pot in gms. (average of all treatments).	Straw per pot in gms. (average of all treatments).
Complete fertilizer ...	27·5	34·3
No potash	28·4	32·7
No nitrogen	18·8	23·9
No phosphate	16·9	22·7
No manure	15·0	19·0

Phosphate and nitrogen are thus shown to be essential to ensure satisfactory yields on soils of the Ye-U area.

An interesting fact revealed by analysis of the plants is the change in the percentage of phosphoric acid in the straw as a result of manuring. Table IV contains the relevant data.

TABLE IV.

Effect of Manuring on the Percentage of Phosphoric acid in Straw.

Treatment. (1)	O (2)	N_1 (3)	N_2 (4)	K_2 (5)	N_1K_2 (6)	N_2K_2 (7)
O ...	0·075	0·058	0·066	0·052	0·173	0·199
P_1 ...	0·075	0·061	0·088	0·108	0·072	0·071
P_2 ...	0·111	0·108	0·121	0·182	0·163	0·165
P_4 ...	0·171	0·151	0·180	0·167	0·171	0·199

The high figures obtained in the treatments N_1K_2 and N_2K_2 cannot be accounted for. In all other cases the percentage increases with the increase in the dosage of phosphate fertilizer. The grain did not show any such regularity.

Originally these experiments were started to discover the cause of the *myitpo* disease of paddy and to find a remedy. So far the disease has never appeared in pot experiments with soils which are well-known to be affected with *myitpo* in the field. In an attempt to induce the appearance of the disease a pot of about 10 inches diameter was filled with the *myitpo* soil from Ye-U Farm and about 500 seeds of Taungdeikpan paddy were sown in it to produce extreme crowding and shortage of nutrients. Almost all the seedlings grew up to maturity and produced grain of a normal character, though the ears carried only two to five grains each. The ear production was delayed by about two weeks and as might be expected the plants were very thin, weak and stunted. There was however no trace of *myitpo*. A similar experiment with the notorious Kywezin soil gave the same result. It is therefore difficult to believe that shortage of any particular nutrient causes the disease. In many *myitpo* areas the disease destroys the whole crop in the field in one year but in another year the same field produces a luxuriant crop without any manuring whatever. This fact also goes against any plant food deficiency theory of the disease. It has been noticed repeatedly that application of Nicifos or similar combinations of nitrogen and phosphate prevents the appearance of the disease and effects a cure of the disease in its early stages. It is not possible to state with certainty how this fertilizer brings about the effect but there is no doubt that its application serves as an effective insurance against the disease and any consideration of profit must take into account the certainty of a crop, fair, medium or high, in the manured field as against the possibility of complete failure in the unmanured field.

(b) Composition of Myitpo *affected and adjacent healthy Plants collected from the Field.*

It was found in last year's work that the *myitpo* affected plants ;re not deficient in the total amount of phosphate absorbed by them compared with adjacent healthy plants but it appeared probable that e disease in some way prevented the translocation and utilization of e nutrient absorbed. In order to obtain confirmatory data and to udy the effect of the season similar material was collected from lected *myitpo* areas and analysed. The results are shown in Tables V ıd VI. It may be stated at once that previous work has been fully ɔnfirmed by this year's results.

TABLE V.

Composition of Myitpo *affected and adjacent healthy Plants.*

Saingnaing South.

Material analysed. (1)		P_2O_5 per cent.				N per cent.			
		26th Aug. (2)	24th Sep. (3)	28th Oct. (4)	1st Dec. (5)	26th Aug. (6)	24th Sep. (7)	28th Oct. (8)	1st Dec. (9)
Root	Affected ...	...	...	3·22	..	...	...	0·67	...
	Healthy ...	0·36	0·24	0·15	0·89	1·12	0·91	0·49	0·40
Plant	Affected ...	...	...	0·14	...	...	...	1·05	...
	Healthy ...	0·23	0·28	0·34	0·16	1·06	1·22	0·71	0·35

Mile 52/5.

Material analysed. (1)		P_2O_5 per cent.			N per cent.		
		9th Sep. (2)	28th Oct. (3)	1st Dec. (4)	9th Sep. (5)	28th Oct. (6)	1st Dec. (7)
Root	Affected	...	2·49	0·11	...	0·62	0·58
	Healthy	0·14	0·70	0·18	0·71	0·68	0·40
Plant	Affected	...	0·12	0·09	...	0·96	0·74
	Healthy	0·16	0·19	0·11	1·83	1·12	0·35

Ye-U Farm.

Material analysed. (1)		P_2O_5 per cent.				N per cent.			
		10th Sep. (2)	30th Sep. (3)	28th Oct (4)	24th Nov. (5)	10th Sep. (6)	30th Sep. (7)	28th Oct. (8)	24th Nov. (9)
Root	Affected ...	...	...	[illegible]·20	0·75	...	...	0·86	0·72
	Healthy ...	0·12	0·10	0·10	0·07	1·01	0·88	0·87	0·56
Plant	Affected ...	...	...	0·74	0·08	...	...	0·97	1·13
	Healthy ...	0·25	0·10	0·15	0·05	1·12	1·16	1·32	0·56

TABLE V—concld.

Composition of Myitpo *affected and adjacent heathy Plants*—concld.

Mile 4/0 Tabayin Road.

Material analysed. (1)		P_2O_5 per cent. 10th Sep. (2)	30th Sep. (3)	28th Oct. (4)	24th Nov. (5)	N per cent. 10th Sep. (6)	30th Sep. (7)	28th Oct. (8)	24th Nov. (9)
Root	Affected ...	...	...	3·62	0·10	...	...	0·62	0·87
	Healthy ...	0·17	0·12	0·10	0·06	0·78	0·88	0·95	0·63
Plant	Affected ...	...	...	0·91	0·12	...	...	0·88	1·13
	Healthy ...	0·22	0·10	0·16	0·11	1·26	1·09	1·41	0·94

TABLE VI.

Weight of P_2O_5 in gms. in the dry matter of tillers.

(1)		Saingnaing South. 26th Aug. (2)	24th Sep. (3)	28th Oct. (4)	1st Dec. (5)	Mile 52-5 9th Sep. (6)	28th Oct. (7)	1st Dec. (8)
Root	Affected	...	...	0·187	...	...	0·214	0·084
	Healthy	0·015	0·013	0·037	0·219	0·0095	0·162	0·114
Plant	Affected	Recovered by harvest time.					0·154	0·129
	Healthy	0·111	0·058	0·127	1·132	0·101	0·526	0·590

(1)		Ye-U Farm 10th Sep. (2)	30th Sep. (3)	28th Oct. (4)	24th Nov. (5)	Mile 4/0 Tabayin Road. 10th Sep. (6)	30th Sep. (7)	28th Oc (8)	24th Nov (9)
Root	Affected ...	...	...	0·275	0·054	...	..	0·315	0·00[illegible]
	Healthy ...	0·007	0·006	0·010	0·014	0·008	0·006	0·021	0·01[illegible]
Plant	Affected ...	...	...	0·685	0·053	...	...	0·617	0·10[illegible]
	Healthy ...	0·084	0·027	0·188	0·364	0·059	0·033	0·331	0·53[illegible]

From Tables V and VI it is clear that at the time *myitpo* diseas occurs in the field the plant suffers a severe physiological disturbanc which is reflected in the high percentage of P_2O_5 in the root. Thi would suggest that the plant is able to obtain sufficient P_2O_5 for it requirement but is unable to utilize it. Besides, the excessive concer tration of this nutrient probably causes the death of the roots. Th lower percentages of P_2O_5 in the root at the time of harvest ar probably due to the development of new roots which had not the tim to suffer any disturbance. The function of the phosphate fertilizer

herefore probably to immobilize some element or elements in the soil. Once the disease is overcome the plant grows up and is then able to utilize the nutrients in the fertilizer so that the yield is increased.

(c) (1) *Water Culture Experiments for the Control of* Myitpo.

To obtain further information on the nature of the *myitpo* disease specimens of healthy and affected plants were collected from Chiba Farm and grown in water culture under different treatments. The data are shown in Table VII.

TABLE VII.

Effect of Treatment in Water Culture on Paddy Plants from Myitpo *Area.*

Yield of dry matter in gms.

Treatment.	Healthy.			Affected.		
	Root.	Straw.	Grain.	Root.	Straw.	Grain.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Complete solution ...	8·1	14·1	5·7	2·2	7·1	0·9
2. Complete solution less N	6·5	10·6	1·5	0·6	2·9	...
3. Complete solution less P	5·0	9·8	1·2	0·3	1·2	...
4. Complete solution plus minor elements = Al, Cr, Fe, Mn, and Pb (4 ppm each).	11·0	17·4	6·7	3·8	8·1	0·8
5. Complete solution plus missing elements = As, Ag, Cd, Co, F, Sb, Sn, Sr and Zn (4 ppm each).	7·2	13·0	2·4	0·2	2·3	...

In the above experiment the affected plants flowered only in treatments 1 and 4 whereas the plants died before flowering in the other cases. The recovery of the plant seems possible only in presence of all the major nutrient elements, recovery being impossible with unbalanced mixtures whether phosphate is present or not.

(c) (2) *Field Manurial Experiments for the control of* Myitpo *Disease.*

In view of the possibility that some minor element present as an impurity in Nicifos, Super or other fertilizer might be the agent in producing the beneficial effect obtained by the use of these fertilizers, it was decided to try the effect of a chemically pure form of Calcium phosphate as well as that of certain elements which were used in two groups. If any benefit resulted from these treatments it would then be easy to readily identify the beneficial element. As a matter of fact only the phosphate treatment produced a response so that it may be concluded that the benefit was derived from phosphate itself and not from a trace or minor element.

As the filter cake from the Zeyawadi Sugar Factory is available at a nominal price and as it contained 4 to 5 per cent P_2O_5, experiments were laid down at Chiba and Ye-U Farms to test the value of the cake as a remedy against *myitpo*. The treatment was at the rate of 5 cwt. of cake per acre. The growth in the treated plots was 30 to 50 per cent better than that in the control plots indicating thereby the possibility of utilizing the manure economically against *myitpo*.

(d) Ah-myitpo *Disease of Paddy in Mandalay District.*

This disease was reported from the neighbourhood of Zegyogon Village, in the Mandalay Canal Area. The symptoms were very similar to those of *myitpo*. The soil had a pH of 7·7 to 8·1 which is not injurious to the rice plant. There was no difference in pH between the healthy and affected soils.

Specimens of the diseased and affected plants were collected and grown in water culture at Mandalay. The treatments and yields are shown in Table VIII.

TABLE VIII.

Effect of Treatments on Plants from Ah-myitpo *Area.*

Yield of dry matter in gms. (average of three bottles).

No	Treatment.	Healthy.			Affected.		
		Root.	Straw.	Grain.	Root.	Straw.	Grain.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Complete solution ...	5·7	17·4	1·6	4·7	7·3	1·6
2	*Minor elements only*	8·6	22·4	1·3	*Plants died.*		
3	Missing elements only	4·2	7·2	0·2	Do.		
4	Complete less B ...	7·8	17·4	0·6	Do.		
5	Do. N ...	6·8	9·7	0·5	1·8	3·4	0·13
6	Do. P ...	4·3	11·1	0·3	Plants died.		
7	Do. K ...	9·7	22·0	1·9	Do.		
8	Do. Fe ...	10·3	28·7	1·4	Do.		
9	Do. S ...	11·5	20·2	1·5	Do.		

Minor elements = a mixture containing 4 ppm. of each of the elements Al, Cr, Fe, Mn and Pb.

Missing elements = a mixture containing 4 ppm. of each of the elements As, Ag, Cd, Co, F, Sb, Sn, Sr and Zn.

Field experiments in the affected fields were also carried out. The treatments tested were pure secondary Calcium phosphate (40 lb. and 120 lb. P_2O_5 per acre), Ammonium sulphate (40 lb. N per acre), Calcium sulphate (40 lb. S per acre), Nicifos (40 lb. N + 40 lb. P_2O_5 per acre), minor and missing elements (4 ppm).

Out of these only P_2O_5 at 120 lb. per acre was effective in saving the affected plants and producing a f:ir yield. It is intended to repeat the experiment in the 1939 season.

(e) We-kite-te *Disease of Paddy in Lower Burma.*

This peculiar trouble was reported from the Pegu District. It seems to affect only seedlings in the seedbed and consists in their withering away suddenly and rapidly. Examination of the soil revealed intense reducing conditions in the soil at the time when the disease occurred. The reducing conditions must result in acute shortage of oxygen to the young roots of the seedlings which probably die in consequence. It therefore appears worthwhile to try to alter the cultural practice so that complete lack of oxygen does not occur in the seedbed especially in the early stage of the growth of the seedlings.

(f) *Minor Industries.*

(i) *Preparation and Storage of Orange Squash.*

The oranges were pealed and the pulp squeezed in an ordinary lemon squeezer. The seeds were removed from the juice by a sieve. The liquid had a pH of 4·5. Citric Acid was added to the juice to make up a concentration of about 1 per cent. As preservative Benzoic acid and Potassium metabisulphite were tested. The following experiments are typical :—

Experiment.

Preservative : Benzoic Acid = 0·01 per cent.
25 oranges used = Cost As. 12.
Weight of oranges = 3·84 kilos.
Weight of skin = 1·35 kilos.
Volume of juice = 1600 c.c.
Sp. Gr. of juice = 1·032.
Citric acid concentration = 0·8 per cent.

Stored in corked bottles. The liquid sedimented quickly leaving a supernatant liquid of water white appearance. When no Benzoic acid was used gas development soon occurred and in a month the material had become mouldy. In presence of Benzoic acid however the liquid remained almost unchanged for about two months after which the colour of the supernatant liquid became yellow and then red. Gas development also occurred and the juice was taken as spoiled.

Experiment.

Preservative : Potassium metabisulphite to produce a concentration of 0·03 per cent of sulphur dioxide.
25 oranges used = Cost As. 12.
Weight of oranges = 3·63 kilos.
Weight of skin = 1·12 kilos.
Volume of juice = 1300 c.c.
Sp. Gr. of juice = 1·033.
Citric acid added = 1 per cent.

Stored in stoppered bottles. The initial appearance of the juice was similar to that in the former experiment. The condition of the

juice was satisfactory at the end of two months. Gradually the supernatant liquid became yellow but there was no evidence of deterioration of the juice at the end of three months.

REMARKS.

On the whole the untreated juice is unattractive and insipid. The Citric acid is intended to improve the taste and keeping quality. Sulphur dioxide seems to be the best preservative and it may be conveniently added in the form of Potassium metabisulphite.

The total volume of juice from 25 oranges costing 12 annas was on the average just sufficient for two bottles of the size generally used for this purpose. Assuming 1 anna for the price of the container and neglecting labour charges and the price of chemicals the cost of production was about 7 annas per bottle. This cannot be lowered as the oranges were bought during the cheapest season. A bottle of this juice was valued at 4 annas by a leading firm in Burma. They also remarked that the juice was insipid and lacking in flavour. Obviously therefore the ordinary Shan oranges offer no scope for the preparation of a marketable orange squash. Inquiries showed that oranges of the Valencia type, which are generally used in making this drink, are not grown in Burma to any appreciable extent.

(f) (ii) *Essential Oils from Local Sources.*

The oil content of several local materials was determined during the year and the results are shown in Table IX.

TABLE IX.

Percentage of Essential Oil in Materials grown in Burma.

Laboratory No.	Material analysed.	Per cent of oil on dry matter.	Remarks.
H32 ...	Cinnamon bark ...	0·40	Mandalay Bazaar.
H34 ...	Do. ...	0·27	D.F O., Bhamo.
H49 ...	Do. ...	0·61	S.A.A. (Hort), Mudôn.
H50 ...	Cinnamon leaves ...	1·77	Do.
H35 ...	Do. ...	Traces ...	D.F.O., Bhamo.
H54 ...	Kadat-ngan	0·08	Mudôn.
H55 ...	Sagasein	2·26	Mandalay Bazaar.
H59 ...	Do. ...	3·16	Sagaing.
H60 ..	Thanat-pyitsi ...	0·92	S.A.A., Paung.

TABLE IX—concld.

Percentage of Essential Oil in Materials grown in Burma—concld.

Laboratory No.	Material analysed.	Per cent of oil on dry matter.	Remarks.
H68 ...	Thet-yin-kado flowers ...	Traces ...	Tenasserim.
H69 ...	Thet-yin-kado leaves ...	Do. ...	Do.
H70 ...	Do. ...	Do. ...	Thatôn.
H71 ...	Thet-yin-kado dried leaves	Do. ...	F.S., Mudôn.
H72 ...	Thet-yin-kado fresh leaves	Do. ...	Do.
H33 ...	Coriander seeds ...	0·10	Mandalay Bazaar.
H36 ...	Do. ...	0·03	S.A.A., Sagaing.
H73 ...	Coriander seeds (Bazaar sample).	0·016	Kassim, Mandalay.
H74 ...	Do.	0·024	Gheewala, Mandalay.
H75 ...	Do.	0·015	Motiram, Mandalay.
H76 ...	Do.	0·020	Ma Sein, Mandalay.
H77 ...	Do	0·017	Ma Ma Gyi, Mandalay.
H78 ...	Do.	0·016	Ma Ma, Mandalay.
H79 ...	Do.	0·020	Ka Ka, Mandalay.
H80 ...	Do.	0·025	Narayandas, Mandalay.
H81 ...	Do.	0·022	Kyaukse.
H82 ...	Do	0·025	Sagaing

The low essential oil content of most of the materials examined rule out the possibility of the extraction of the oil being made into a local industry. *Sagascin* is the only promising material so far met with and it is intended to explore the possibility of its utilization more fully next year. It may be mentioned that the local coriander seeds have extremely low oil content whereas the seeds grown in Europe have an essential oil content from 0·1 to 1·0 per cent.

(f) (iii) *Preparation of Road Surfacing Material from Molasses.*

In order to find some use for the large quantities of molasses produced in the sugar factories of Burma a method developed at the Imperial Institute of Sugar Technology, Cawnpore, was adopted to convert the local molasses into a road surfacing composition. With the limitations imposed by laboratory conditions the preparation was carried out in small lots using 6000 gms. of molasses in each batch. The conditions prescribed in the original method had to be modified slightly. It was

found that the temperature of the acidified mass could not be raised to 230°C as prescribed in the original procedure with the local molasses and the highest temperature used in the present work was 150°C. A total quantity of about 1 cwt. has been prepared which compares very favourably in appearance with a sample obtained from Cawnpore. The prepared material will be tested on the road at Mandalay.

(g) *Loss of nitrogen from treated sugarcane plots at Pyinmana.*

It had been noticed that the yield of sugarcane on the Pyinmana Farm reached a maximum value with 60 lb. of nitrogen per acre added as Ammonium sulphate. Even the 40 lb. treatment gave almost the maximum yield. In other cane growing countries much larger doses of nitrogen are known to push up the yields. The possible causes of the lack of response at Pyinmana with the higher doses might be due to the loss of nitrogen from the soil by drainage, percolation and denitrification or due to some other nutrients in the soil becoming insufficient for increased growth. This year the first of the two possibilities, namely, the loss of nitrogen has been examined. It was found that considerable loss of total nitrogen took place in the Pyinmana soil during the monsoon. The extent of the loss was very much more than the highest dose of nitrogen added as manure. The larger doses of nitrogen may therefore become ineffective in this way. How this loss took place is not properly understood but it may be mentioned that a determination of the nitrogen content of the drainage water collected on various dates after rain and of the rate of percolation, whereby the Pyinmana soil was found to be very porous, indicated the possibility of a part of the loss taking place in this way.

(h) *Composition of the fodder grasses of Burma.*

A study of the composition of several samples of Burma Fodder grasses was carried out during the year in collaboration with the Economic Botanist. The samples were sent by the Director of Supply and Transport, Army, Burma. All the grasses were found to be poor both in protein and fat, those grown in the Shan States being the poorest. The grasses of Upper Burma were slightly richer than those of Lower Burma. In mineral content also the grasses of the Shan States were the poorest, especially in P_2O_5.

The average composition of grasses from Lower Burma, Upper Burma and the Shan States is shown in Table X.

TABLE X.

Average composition of the fodder grasses of Burma.

Per cent on dry matter.

Origin.	Crude protein.	Crude fibre.	Ether extract.	Carbohydrate.	Ash.	P_2O_5.	CaO	K_2O	Fe_2O_3
Shan States ...	2·56	34·15	1·12	55·39	6·78	·157	·504	·864	·046
Lower Burma ...	4·24	27·03	0·93	58·39	9·13	·319	·323	1·433	·067
Upper Burma ...	6·36	23·99	1·16	52·97	10·31	·398	·561	1·587	·118

(i) *Survey of Shangale-kyun soils for tobacco growing.*

It is believed that light textured soils are more suitable for the growth of high grade cigarette tobacco than heavy textured ones. A survey of the Shangale-kyun tobacco area was undertaken for the Economic Botanist to enable him to choose a suitable area for his tobacco experiments. The coarse sand and fine sand fractions together varied from about 50 to 70 per cent and the clay fraction varied from 12 to 20 per cent. There was some correlation between texture and quality of the leaves as the lighter soils produced better leaves for curing. The variety of tobacco grown however seems to have the greatest effect on quality in the area.

V. Administration.

I was on duty without absence throughout the year.

U Po Shin, A.T.M., B.A.S., II, was on leave on average pay without Medical Certificate for 16 days from 3rd January 1939 (forenoon) and retired on superannuation pension on expiry of this leave.

Mr M. M. Menon, Senior Agricultural Assistant (Chemistry), was on deputation to Rangoon for training in Statistics from 15th June 1938 (afternoon) to 6th October 1938 (forenoon). He officiated in Burma Agricultural Service, Class II in place of U Po Shin, B.A.S., II, granted leave from 3rd January 1939 (forenoon) and was appointed to Burma Agricultural Service, Class II, on probation from 19th January 1939 (forenoon) in place of U Po Shin, B.A.S., II, retired.

U Ko Ko Gyi was appointed as a Senior Agricultural Assistant (Chemistry) in place of Mr. M. M. Menon promoted to B.A.S., Class II. He reported for duty from 24th March 1939 (forenoon).

The other Assistants were on duty throughout the year.

Maung Gyi, Fieldman, was on leave on average pay without Medical Certificate for two months from 21st November 1938 (forenoon) and returned to duty on 21st January 1939 (forenoon). Maung Than Maung, Duftry in Principal's office, officiated in Maung Gyi's place.

Maung Sin, peon, was promoted to be a temporary Preparer from 16th June 1938 (forenoon).

Surajul Huck was appointed as a Boiler Attendant for three years from 3rd November 1938 (forenoon) in place of Abdul Aziz, Boiler Attendant, discharged from service on medical grounds with effect from the same date.

I was on tour for 32 days. Dr. Aiyar was on tour for five days. Mr. M M. Menon was on tour for ten days and Mr. T. K. Sen was on tour for nine days. Maung Hla Tin, Preparer, accompanied Dr. S. P. Aiyar on tour.

A. T. Sen,
Agricultural Chemist, Burma, Mandalay.

Annual Report of the Economic Botanist, Burma, for the year ending the 31st March 1939.

I. Research.

Paddy (*Oryza sativa* Linn.).—Nineteen pure lines of paddy were grown at Mandalay and 14,206 lbs. (13,734) of seed were handed over for multiplication. Eight pure lines previously multiplied were discontinued, only maintenance cultures being grown.

Yield Trials.—Three varieties of *Yathe* tested in two Latin Squares failed to show reliable differences. Four varieties of *Mawtike* in a Latin Square test likewise failed to pass the Z test. A Latin Square of six varieties of *Thonzaloo* and another with *Myaukla* also failed to show reliable differences.

Six strains of Patnai were tested together with Faya, *Taungdeikpan*, *Ngayunwabo* and *Shweat* in a 10 × 5 Graeco-Latin Square.

Table I.

Arrangement.—10 × 5 Graeco-Latin Square.
Plots.—6′ × 18′ = 1/303·5 acre.
Sown on 15th June, transplanted 3rd August,
Harvested on 12th January 1939.
Planted with uniform seedlings at measured distances.

Variety. (1)	A *Patnai* A37-137. (2)	B *Patnai* A37-138. (3)	C *Patnai* A37-139. (4)	D *Patnai* A37-140. (5)	E *Patnai* A37-141. (6)	F *Patnai* A37-142. (7)
Yield, lbs. per acre.	2497·5	2794·4	2465·5	2502·8	2751·7	2270·0
Per cent ...	99·2	110·9	97·9	99·4	109·2	90·1

Variety. (1)	G *Faya* A37-114. (8)	H *Taungdeikpan* T30-123. (9)	I *Shweat.* (10)	J *Ngayunwabo.* T33-119. (11)	Mean. (12)	S.E. (13)
Yield, lbs. per acre.	1647·8	2701·9	2593·0	2842·4	2516·7	134·6
Per cent ...	65·4	107·3	106·9	112·8	100	5·34

J B E H I D A C F G

Ngayunwabo is highest closely followed by Patnai A37-138. Faya has yielded very poorly and as the rice is slightly scented it will be discarded. Two of the Patnais are about as good as the old-established strains under distribution in the Mandalay and Shwebo Districts and will be retained for further trials.

Grain Selections.—A yield trial of selected *Mawtike* varieties which produced translucent rice in 1937-38 was done but failed to give definite results. The translucent character was maintained in the selected strains.

Mohnyin Paddies.—One hundred and forty cultures were grown at the Mohnyin Seed Farm. Crops were generally good but a fair amount of *kyetthun* disease occurred in some plots particularly on varieties with slender straw and on the outside rows of plots. The disease was not as severe as on many cultivators plots. Yields of the two middle rows were taken from each culture as a rough indication of yield and milling tests have been completed. Of the single plant selections made from local varieties some appear promising but lack a good translucent grain. Of the hybrids between D29-166 and A28-6 received from Hmawbi in 1938 the yields appeared to be only about half those of the local types though milling was generally high. Most of them were too long lived for the district. Other hybrids between Blue Rose and *Kalagyi*, *Anbaw* and Blue Rose, C15-10 and C14-8, *Letywezin* and *Kalagyi* had to be discarded for unsuitable life period, susceptibility to *kyetthun* disease or poor growth. Patnai varieties had suitable life periods and the yields appeared likely to be up to average though there was considerable *kyetthun* damage. *Mya* C32-1 and Lead Rice C37-116 grew fairly well but the yields were rather low

Hybrids.—There was one yield trial at Mandalay between hybrids with grain of the *Taungdeikpan* type involving 21 hybrids and four pur lines arranged in three balanced Lattices. The varieties were :—

1. *Taungdeikpan* × *Naungtu* X 37-85.
2. *Taungdeikpan* × *Naungtu* X 37-79.
3. *Taungdeikpan* × *Naungtu* X 37-97.
4. *Taungdeikpan* × *Naungtu* X 37-98.
5. *Taungdeikpan* × *Naungtu* X 37-116.
6. *Taungdeikpan* × *Naungtu* X 37-131.
7. *Taungdeikpan* × *Naungtu* X 37-136.
8. *Taungdeikpan* × *Naungtu* X 37-156.
9. *Taungdeikpan* × *Naungtu* X 37-157.
10. *Taungdeikpan* × *Naungtu* X 37-160.
11. *Taungdeikpan* × *Naungtu* X 37-175.
12. *Mweswe* × *Ngayunwa* X 37-200.
13. *Mweswe* × *Ngayunwa* X 37-204.
14. *Mweswe* × *Ngayunwa* X 37-208.
15. *Mweswe* × *Ngayunwa* X 37-209.
16. *Mweswe* × *Ngayunwa* X 37-210.
17. *Mweswe* × *Ngayunwa* X 37-215.
18. *Mweswe* × *Ngayunwa* X 37-217.
19. *Mweswe* × *Ngayunwa* X 37-219.
20. *Mweswe* × *Ngayunwa* X 37-221.
21. *Mweswe* × *Ngayunwa* X 37-260.
22. *Naungtu* 1—6.
23. *Theikpan Taungdeikpan* T30-123.
24. *Ngayunwa* T8.
25. *Mweswe* A29-212.

TABLE II.

Adjusted varietal means.

Yields in lbs. (mean of 3 plots). S.E. = ± ·2476.

Varieties.		Adjusted varietal means.			
1— 5 ...	4·252	3·164	4·040	3·888	3·764
6—10 ...	4·455	2·455	4·256	4·228	3·511
11—15 ...	4·411	3·043	4·552	4·234	4·518
16—20 ...	3·807	3·540	3·572	3·702	3·875
21—25 ...	3·317	3·633	4·057	3·234	3·133

X37-136 is the lowest yielder, but the differences between it and X37-79, X37-200 and A29-212 are not significant. X37-204 has given the highest outturn but it is not possible to distinguish certainly between it and Nos. 1, 3, 4, 6, 8, 9, 11, 13, 14, 15, 20 and 23. Eight of the new hybrids have out-yielded the standard variety *Taungdeikpan* but not with statistical certainty in every case. Thirteen of the total number can be discarded for unsatisfactory yield with a certainty of 5 per cent.

There were 134 cultures of other hybrids most of them in the F_4 and F_3 generations. A severe weeding-out of these has now become necessary and the newer methods of yield testing with larger numbers of varieties will enable this to be done next season. There were in addition eleven F_1 cultures and 13 F_2.

Effect of moisture on Storage of Paddy.—The variety *Kalagyi* which is produced in the Mohnyin area has been complained of as being liable to yellow discoloration in store. A series of tests were therefore undertaken in which the storage conditions were controlled for temperature, CO_2 content and humidity. It was found that the production of CO_2 by paddy in store was comparatively small provided the conditions were not such as to cause mould growth, in which case CO_2 from respiration of the moulds was abundantly produced. There was no evidence that CO_2 had anything directly to do with discoloration. *Kalagyi* was found to have a greater affinity for moisture than any other paddy tested but moisture affinity did not appear to be correlated with liability to discoloration. Actually some paddies, notably *Taungdeikpan*, having lower water affinities showed less resistance to discoloration than *Kalagyi*. The complaints about *Kalagyi* seem to be due to the fact that the Mohnyin Valley is so humid and foggy from December to March that this variety is always stored with an excessively high moisture content beyond what it can stand. Other paddies under similar conditions would probably discolour more. The full results of this work will be published elsewhere but the following table gives an indication of the varietal differences observed.

TABLE III.

Moisture percentages of paddy after 30 days storage at 35°C at three relative humidities.

Relative humidity, per cent. (1)	*Bommadewa.* (2)	*Ngathalun.* (3)	*Taungdeikpan.* (4)	*Kalagyi* D15. (5)	*Emata* A28-8. (6)	*Ngayunwa* 8. (7)	*Okshit Mayin.* (8)
60·0	11·69	11·57	11·82	11·92	11·73	11·80	11·77
78·0	14·08	13·96	14·07	14·43	14·10	14·00	14·04
87·4	15·98	15·65	15·76	16·47	16·12	15·79	15·99

Figures for paddy, loonsain and polished rice showed approximately the same varietal differences.

The varieties *Taungdeikpan*, *Ngasein* C15-10 and *Kalagyi* D15 were stored in 1937 under six relative humidities for 171 days and then at the lowest humidity (57 per cent) for 44 days, after which they were milled in a Minghetti machine by the Rice Research Officer. The amount of discoloration was difficult to assess because of loss of brokens in the machine but *Taungdeikpan* clearly developed most discoloration followed by *Ngasein* with *Kalagyi* least. This is the opposite of what would be expected on moisture affinities. Increase of temperature, 36°C as compared to room temperature, caused more discoloration. At humidities below 78 per cent there was very little discoloration, while at 87·4 per cent discoloration was very bad. A repetition of this experiment in 1938 gave the same results.

Observations on the influence of various field treatments on the breakage of rice in milling.—A complex experiment on the effect of various treatments of paddy at harvest time on the outturn of whole rice was done in 1937-38 but owing to delay in completing the results was not reported in 1938. The variety *Ngasein* C 2104 was used with all combinations of the following treatments :—

1. Stacking Methods (S)
   - (i) Sheaves on ground not turned.
   - (ii) Sheaves on ground turned daily.
   - (iii) Sheaves stacked heads northwards.
   - (iv) Sheaves stacked heads southwards.
2. Stacking Times (D)
   - (i) 5 days.
   - (ii) 10 days.
3. Drying Methods (M) (Threshed grain.)
   - (i) In sun and dew (uncovered at night.)
   - (ii) In sun but covered at night.
   - (iii) In shade.

4. Drying Times (T) (Threshed grain.)
   (i) 2 days.
   (ii) 4 days.
   (iii) 6 days.
   (iv) 8 days.
   (v) 10 days.

After completing the various treatments the paddies were stored n tins in 25 lb. lots and milled in a Minghetti machine.

TABLE IV.

Mean Hulling Per cent for method of stacking.

—	S (i).	S (ii).	S (iii).	S (iv).	Mean.	S.E.
Per cent whole rice ...	52·80	48·48	58·29	55·29	53·72	±·537
Per cent of mean ...	98·30	90·25	108·52	102·92	100	±1·000

S(iii) S(iv) S(i) S (ii).

Stacking heads northwards is more than 10 per cent superior to the commoner method of leaving the sheaves lying on the ground. Turning the sheaves daily is definitely harmful. Stacking with the heads northwards is the normal procedure in the Mandalay neighbourhood.

The mean hulling per cent for number of days in stack shows that five days is superior to ten days, 55·87 per cent against 51·56 per cent ±0·378, a difference of nearly 8 per cent of whole rice.

TABLE V.

Mean Hulling Per cent for method of drying threshed grain.

—	M(i).	M(ii).	M(iii).	Mean.	S.E.
Per cent whole rice ...	51·54	54·69	54·91	53·72	±·443
Per cent of mean ...	95·95	101·81	102·22	100	±·825

M(iii) M(ii) M(i).

Shade drying gives the best whole rice outturn but is probably not often practicable. It is not definitely superior to drying in the sun with protection from dew at night. Alternate drying in the sun and wetting with dew is harmful.

TABLE VI.

Mean Hulling per cent for drying time for threshed grain.

——	T (i).	T (ii).	T (iii).	T (iv).	T (v).	Mean.	S.E.
Per cent whole rice	54·27	54·15	54·10	53·60	52·45	53·72	±·572
Per cent of mean	101·03	100·82	100·72	99·78	97·65	100	±1·06

T(i) T(ii) T(iii) T(iv) T(v).

Increasing the drying time has decreased the whole rice outturn.

Effect of moisture on hulling per cent.

Four varieties of paddy, *Ngathalun*, *Ngasein* C2104, *Taungdeikpa* and *Emata* A28-6 were placed in a closed tin in thin layers over wate and allowed to absorb moisture. Samples were drawn at intervals c 12, 24, 48, etc. hours for milling and moisture tests. Correlations an regressions of hulling per cents and moisture contents were then calcu lated and are given in Table VII.

TABLE VII.

Effect of moisture content on Hulling Per cent of paddy.

Variety.	Mean moisture per cent. x	Mean hulling. per cent. y	Correlation Co-efficient.		Regression Coefficient	
			r	t	bx y on x	by x on y
Ngasein ...	10·60±·896	52·86±3·735	-·7101	3·7730	-2·958%	-·1797%
Taungdeikpan.	11·425±·932	43·572±10·450	-·7788	4·6471	-8·735%	-·0695%
Ngathalun	10·809±1·036	62·252±2·981	-·6784	3·4533	-1·953%	-·2356%
Emata ... A 28-8.	11·736±·807	42·794±5·392	-·8798	6·9307	-5·881%	-·1316%

The decrease in whole rice with increase in moisture content is clear. The results are probably not well represented by straight regressions but the data do not warrant fitting polynomial curves. The rate of increase of breakage with increase of moisture appears to rise rapidly above about 12·5 per cent.

Effect of Repeated application of Manures to paddy at Mandalay for 11 years.

The result of the Permanent Manurial Series at Mandalay in which various fertilizers have been applied continuously from 1927 have been examined for trend. The details of the experiment are given in the Annual Reports of the Agricultural College Station. Briefly there are 10 treatments (including no manure) and 4 replications on 0·1 acre plots in two series with controls between each manured pair of plots, giving 74 plots in all. The arrangement is systematic. The treatments are :—

1. Lime 5 cwt. CaO per acre every fourth year.
2. Sodium nitrate 40 lbs. N_2 per acre.
3. Ammonium sulphate 40 lbs. N_2 per acre.
4. Superphosphate 40 lbs. P_2O_5 per acre.
5. Bone meal 40lbs. P_2O_5 per acre.
6. Potassium sulphate 40 lbs. K_2O per acre.
7. Ammonium sulphate 40lbs. N_2 + Superphosphate 40 lbs. P_2O_5.
8. Ammonium sulphate 40 lbs. N_2 + Superphosphate 40 lbs. P_2O_5 + Potassium sulphate 40 lbs. K_2O.
9. Farmyard manure 40 lbs. N_2.
10. No manure.

All fertilizers were applied just before planting. Variations from year to year in yields of treated plots are due to various factors of which only two prominent ones have been examined. The period is too short for a more detailed analysis. The most prominent effects are—

1. Pure seasonal fluctuation.
2. Cumulative effects of the manures applied. Assuming that the seasonal fluctuations experienced by the treated and untreated plots to be alike the multiple regression function $y-\bar{y}=b_1 (x_1-\bar{x}_1)+b_2 (x_2-\bar{x}_2)$ is fitted to the yields of the treated plots, where y is the yield of treated plots, x_1 the cumulative doses of manure and x_2 the yield of the corresponding controls.

The results for superphosphate alone and Farmyard manure show a significant rise in the yield of these plots. In combination with Ammonium sulphate Super does not give reliable evidence of improved yields. Ammonium sulphate alone shows a rather distinct decline in its effect in later years but is not quite statistically significant. Other manures appear to be almost without effect. Plots unmanured do not show any decline in yield.

Effect of Manures on Breakage of rice during milling.—In 1930 and 1931 trials carried out with a *moung* on samples from the Permanent Manurial Series at Mandalay with *Ngasein* C2104 paddy indicated that paddy from plots receiving dressings of ammonia and/or phosphate gave lower outturns of whole rice when milled. A repetition of this test in 1938 using the Minghetti machine failed to confirm these results and showed only slight variation between treatments. These conflicting results are not explainable at present.

Myitpo Experiments.—Three manurial experiments were done to ascertain the response to phosphatic and nitrogenous manures at Chiba and Ye-u in the Shwebo District. At Chiba there was no *myitpo* disease last year while at Ye-u it was severe.

TABLE XII.

Mean of Spacing. Yields per acre in lbs.

S.E. (Total of 4 plots) = ±170·83 lbs. per acre.

— (1)	V_1 *Taungdeikpan.* (2)	V_2 *Ngathalun.* (3)	V_3 *Yathe.* (4)	Mean S.E. = ± 98·64 lbs. per acre. (5)
M_1 No manure ...	217·8	511·1	140·0	289·6
M_2 40 lbs. P_2O_5 per acre	1710·9	2297·5	2226·4	2078·3
M_3 40 lbs. P_2O_5 + 20 lbs. N_2 per acre.	2062·0	2473·1	2564·2	2366·4
M_4 40 lbs. P_2O_5 + 40 lbs. N_2 per acre.	2446·4	2868·6	2581·9	2632·3
M_5 Mean S. E. = ± 85·41 lbs.	1609·3	2037·6	1878·1	...

Ngathalun is decidedly more resistant to *myitpo* than the other two varieties. All treatments are very much better than the control. The addition of nitrogen to the phosphate is significantly beneficial. The increases due to manures are of very large dimensions as the following table shows :—

TABLE XIII.

Increases per cent over no manure.

—	*Taungdeikpan.*	*Ngathalun.*	*Yathe.*
40 lbs. P_2O_5 per acre ...	685·5	349·5	1490·3
40 lbs. P_2O_5 + 20 lbs. N_2 per acre.	846·8	383·9	1731·6
40 lbs. P_2O_5 + 40 lbs. N_2 per acre.	1023·2	461·3	1744·2

There was no significant difference in yield between the two spacings. The closer spacing was slightly higher than the wider.

The second experiment was intended to ascertain whether manuring with phosphate in the nursery would be effective in preventing *myitpo* in the transplanted crop and also to find out the best N/P ratio. The variety *Taungdeikpan* was used and the lay-out was a modified Latin Square with split plots for manured and unmanured seedlings. The treatments were all combinations of—

Superphosphate	P_0 No phosphate.
	P_1 30 lbs. P_2O_5 per acre.
	P_2 60 lbs. P_2O_5 per acre.
	P_3 90 lbs. P_2O_5 per acre.
	P_4 120 lbs. P_2O_5 per acre.
Ammonium sulphate	N_0 No nitrogen.
	N_1 20 lbs. N_2 per acre.
Manuring in nursery	M_0 No manure.
	M_1 80 lbs. P_2O_5 as Superphosphate.

TABLE XIV.

Chiba Experiment. Yields per acre in lbs.

S.E. = 5·18 per cent or ± 132·7 lbs. per acre.

— (1)	P_0 No P_2O_5 (2)	P_1 30 lbs P_2O_5 (3)	P_2 60 lbs P_2O_5 (4)	P_3 90 lbs. P_2O_5 (5)	P_4 120 lbs. P_2O_5 (6)	Mean S.E. = ± 59·34 lbs. per acre. (7)
N_0 No nitrogen	A 2073·55	B 2395·30	C 2344·64	D 2698·38	E 2564·17	2415·21
N_1 20 lbs. nitrogen	F 2360·64	G 2693·93	H 2761·48	I 2891·24	J 2811·25	2703·71
Mean S. E. = ± 93·82 lbs. per acre.	2217·09	2544·67	2553·06	2794·81	2687·71	...

I J H DG E B F C A

The application of phosphate has given increased yields and the addition of nitrogen has further increased the yield. This conflicts with the results in the first experiment where nitrogen had a deleterious effect. The percentage increases over no manure are shown in Table XV.

TABLE XV.

Percentage increases over no manure—Chiba.

— (1)	P_0 No P_2O_5 (2)	P_1 30 lbs. P_2O_5 (3)	P_2 60 lbs P_2O_5 (4)	P_3 90 lbs. P_2O_5 (5)	P_4 120 lbs. P_2O_5 (6)
No nitrogen ...	...	15·5	13·1	30·1	23·7
20 lbs. N_2 ...	13·8	29·9	33·2	39·4	35·6

The effect of manuring the nursery was not significant at Chiba.

At Ye-u while the *myitpo* attack was not intense it was considerable on the unmanured plots and the response to phosphate was very marked. Nitrogen also gave a positive response contrary to the usual experience on fields badly attacked by *myitpo*. It also increased the yield in combination with phosphate but not in a simple additive way.

TABLE XVI.

Ye-u Experiment. Yields in lbs. per acre.

S. E. = ±129·5 lbs. per acre.

— (1)	P_0 No P_2O_5 (2)	P_1 30 lbs. P_2O_5 (3)	P_2 60 lbs. P_2O_5 (4)	P_3 90 lbs. P_2O_5 (5)	P_4 120 lbs. P_2O_5 (6)	Mean S.E. = ±57·9 lbs. per acre. (7)
N_0 No nitrogen ..	452·40	1925·13	2156·21	2459·29	2467·29	1892·06
N_1 20 lbs. N_2 ...	903·01	2077·11	2419·20	2502·84	2622·86	2105·02
Mean S. E. = ± 91·6 lbs. per acre.	677·70	2001·12	2287·75	2481·07	2545·06	...
	A	B	C	D	E	

TABLE XVII.

Percentage increases over no manure —Ye-u.

— (1)	P_0 No P_2O_5 (2)	P_1 30 lbs. P_2O_5 (3)	P_2. 60 lbs. P_2O_5. (4)	P_3. 90 lbs. P_2O_5 (5)	P_4 120 lbs. P_2O_5 (6)
N_0 No nitrogen ...	...	325·5	376·6	441·4	547·6
N_1 20 lbs. nitrogen	99·6	359·1	434·8	453·2	579·8

The results of manuring the nursery are significant and are given in Table XVIII.

TABLE XVIII.

Effect of manuring nursery in addition to field—Ye-u.

S.E = ±92·45.

— (1)	P_0 N_0 P_2O_5 (2)	P_1 30 lbs P_2O_5. (3)	P_2 60 lbs. P_2O_5 (4)	P_3 90 lbs. P_2O_5 (5)	P_4 120 lbs. P_2O_5. (6)	Mean S.E = ±7·95 lbs. per acre. (7)
M_0 Nursery unmanured.	589·27	1982·01	2313·53	2441·52	2535·73	1972·41
M_1 Nursery manured.	766·14	2020·23	2261·98	2520·62	2156·58	2024·67
Mean±S.E.= ±91·59 lbs. per acre.	677·70	2001·12	2287·75	2481·07	2545·06	...

The increase from nursery manuring alone is 30·0 per cent, and is significant.

When the nitrogen and no nitrogen groups are compared that part receiving a dressing of Super in the nursery outyielded that from unmanured seedlings by 10·7 per cent.

These experiments considered together with others conducted by the Deputy Director of Agriculture, Northern Circle show that very large increases are to be expected from superphosphate in the Ye-u *myilpo* areas. The addition of nitrogen may or may not be beneficial, but is probably not paying in any case, whereas phosphate alone definitely is. In the Shwebo area the response to phosphate, though definite, is much smaller and here again nitrogen may or may not increase the yield further.

Early sesamum (*Sesamum orientale*, Linn.).—The early sesamum work was done at Magwe Seed Farm and a fair average crop was raised. Seven pure lines were under multiplication. Twenty-nine cultures of Burmese sesamums were grown and a number of these will be tested in a yield trial this year. Oil contents were generally good and in the best lines now exceed 55 per cent. Ten cultures from Southern India were rather too long-lived for Magwe but may do well at Allanmyo under a higher rainfall. They will be given to the Deputy Director of Agriculture, West Central Circle for trial there. Thirty-three hybrids between Burmese types and strains from Palestine were grown ; of these eleven have been retained for further tests. A strain from Sarawak which looked promising and grew very well failed by reason of its low oil content of only 41 per cent.

Pe-sin-ngôn [*Cajanus cajan* (Linn.) Millsp.].—Seventy-five cultures were grown at Mahlaing and eleven strains were multiplied in half-acre plots widely spaced at Mandalay. At Mahlaing growth was good and several strains appear to be much superior to the C10 variety now under distribution. Three selections from New Era Strain X show great promise, being of good habit, prolific and having better seed. Storage tests with 133 selections are now proceeding in the laboratory. An examination of the figures for insect attack on the seed both on the plant before harvest and later in store did not reveal any association between the strains grown in 1937 and 1938, indicating that the amount of insect damage appears to be largely a matter of chance and not to depend on inherited characters of resistence. Strains which suffered much in one year were little damaged in the next and *vice versa*.

Some exotic strains received rather late from Hawaii did not grow well at Mahlaing, perhaps because of late planting. They will be given a second trial next season.

Gram (*Cicer arietinum*, Linn.)—Yield trials of 25 varieties consisting of selections from Karachi, Bassein, Pusa and Burmese grams were laid down at Minhla, Sinbyugyun and Chinya in the West Central Circle. There have been reports that wilt disease of gram is affecting the crops in this circle and it is desirable to test out all new lines of gram for wilt resistance. The varieties included in the three trials done last year were :—

No. 1	Karachi	311	No. 14	Karachi	3121
No. 2	Do.	312	No. 15	Do.	3122
No. 3	Do.	313	No. 16	Do.	3123
No. 4	Do.	314	No. 17	Do.	3124
No. 5	Do.	315	No. 18	Do.	3125
No. 6	Burmese	316	No. 19	M 1	...
No. 7	Karachi	318	No. 20	M 3	...
No. 8	Do.	319	No. 21	P 21	...
No. 9	Do.	3110	No. 22	Pyinbyu	Burmese
No. 10	Do.	3114	No. 23	Bassein	35—34
No. 11	Do.	3117	No. 24	Do.	35—35
No. 12	Do.	3118	No. 25	Do.	35—36
No. 13	Do.	3120			

The final result for the trial done at Chinya (Pakôkku Township) is given in Table XIX.

TABLE XIX.

Gram Variety Yield Trial at Chinya.

Arrangement—Three balanced lattices.
Plots—1/121 acres.

Varietes. (1)	Adjusted yields of varieties in lbs. per acre. (2)				
Nos. 1—5 ...	653	678	545	726	605
6—10 ...	569	641	670	787	581
11—15 ...	702	653	411	678	581
16—20 ...	641	593	605	557	750
21—25 ...	641	641	411	339	569

S.E. = ±64·5 lbs. per acre.

Critical Difference at 5 per cent level = 188 lbs. per acre.

The yields were only recorded to the nearest pound and it would have been better if smaller units had been used. The variety Bassein 35—35 is the lowest yielder but it is not significantly inferior to Nos. 23 and 13. Karachi 3110 has given the highest yield but it is not significantly superior to 14 others. Burmese 316 is significantly inferior to Karachi 3110 and nearly so to M3. Ten strains can be discarded as having given low yields with a certainty of 5 per cent though it cannot be decided from these figures whether these low yields were the result of inherent low productivity or to poor germination or wilt disease.

The results of the trials at Minhla and Sinbyugyun had not been analysed in time for this report. They show considerable yield differences and variation in the amount of disease in the plots.

Wheat.—Thirty-six strains, including Pusa 120 and P. 165 for the first time, were under trial at Mandalay. Both the new Pusa strains were resistant to rust. Some newly introduced lines from America were too long-lived for our conditions. One selection from Sagaing 28—22 was multiplied and was also tried on one-quarter acre after paddy. The plants grew quite well in the paddy field but the yield was low and the grain shrivelled.

Mustard (*Brassica juncea* Coss.).—Trials with 16 varieties of mustards from India were made at Mandalay and at Shangale-kyun. Growth was poor at Mandalay but some seed of all varieties was obtained. There was a complete failure on the *kyun* land.

Pasture Grasses.—Enquiries were begun in 1938 into the composition of samples of hay as supplied to the Army in Burma and also into the chemical composition of the principal grasses making up hay mixtures. A large number of samples were kindly sent by the Director of Supply and Transport. It appears that a large part of the " Hay Doob " as supplied in Lower Burma consists not of true doob (*Cynodon dactylon* Pers.), but of *Sporobolus glaucifolius* Hochst. This grass

is finer in texture than doob and is not inferior to it in mineral content. If anything it is superior to true doob as a hay. Samples of true doob from Upper Burma (Kyauksè and Madaya) were superior to those from the Twante Canal area in protein, P_2O_5 and calcium. In respect of P and Ca they were almost equal to good English hay. Grasses supplied as " Hay ordinary " from hill places, mostly in the neighbourhood of Maymyo, were rather poor, especially in protein and P_2O_5. The calcium/phosphate ratio was often of the order of 3 : 1. In general grasses from the hills were much inferior to grasses from the plains. The following table gives some figures for the mineral contents of Burmese grasses.

TABLE XX.

Variety.	Locality.	Crude Protein.	Crude Fibre.	Crude Fat.	Carbo-hydrate.	Ash.	Moisture on Air Dry Matter.	P_2O_5.	CaO	K_2O	Fe_2O_3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sporobolus glaucifolus Hochst. (False Doob).	Lower Burma ...	4·18	26·54	0·98	59·62	8·67	7·91	·422	·336	1·276	·050
Cynodon dactylon Pers. (Doob) ...	Do. ...	4·25	27·42	0·92	68·20	9·22	6·17	·302	·321	1·444	·070
Do.	Upper Burma ...	6·16	30·51	0·77	53·75	8·80	7·18	·515	·481	1·566	·187
Dicanthium annulatum Stapf. (Padaw-ni).	Mandalay ...	6·49	28·30	1·42	52·45	11·34	6·52	·320	·613	1·601	·072
Anthistiria (Themeda) imberbis T. Cooke.	Maymyo ...	2·07	34·70	1·02	55·50	6·71	6·46	·153	·474	0·784	·016
Cymbopogon spp. (Scented grasses) ...	Do. ...	2·01	36·15	1·06	56·92	3·86	5·56	·042	·310	0·682	·027
Andropogon filipendulus Hochst. ...	Do. ...	1·83	38·73	0·74	52·99	5·71	7·98	·102	·260	0·635	·039
Amphilophis pertusa Stapf (Padaw-byu).	Mandalay ...	6·06	25·57	1·64	55·45	11·28	4·65	·149	·936	2·028	·094
Mean for Lower Burma plains grasses (Twante and Bogale areas).	Lower Burma ...	4·24	27·30	0·93	58·39	9·13	6·42	·319	·323	1·433	·069
Mean for Upper Burma plains grasses (Madaya, Kyauksè and Mandalay areas).	Upper Burma ...	6·36	23·99	1·16	52·97	10·31	6·79	·398	·561	1·587	·118

Seeds of 25 varieties of grasses, of which six were exotic, were sown at Mandalay but failed to germinate. Eighteen local grasses were planted out in small plots from sets and records of yields were made. The hay from these is being analysed. The Deputy Director of Agriculture, East Central Circle, is co-operating in this work at Tatkôn.

Peas and Beans.—Eight hybrid strains of *P. lunatus* Linn. with two strains under distribution as controls were tested in a 5 × 5 Graeco-Latin Square but failed to give significant results. However, several new hybrids seem likely to be somewhat superior in yield to the existing strains of Butter Beans and it is hoped they will have lower prussic acid contents. The analyses are not yet complete.

Fifty-five cultures of hybrids between *Moki Lima* × *pègya* and *Moki* × *pèbyugale* were grown. There are now in the F_{11} generation. From these 345 single plant selections have been made for further study in the laboratory.

Soy beans [*Glycine max* (Linn.) Merr.].—Sixty-five strains besides the three under distribution were grown. Of these Burmese *pè-ngapi* 25-37 gave the highest yield followed by *Seikhpyu* 37-84. Other good yielders were Behrum 24-47, Pyinmana 31-18, Lasi N'Loi 35-112 and 35-113, Kwangsi Black 37-70, Kwangton 37-74, Mogaung 37-79 and Pa-an 37-82. The two strains from Java, Kedalee 35-57 and 35-58 were late but prolific.

Miscellaneous Beans.—Selected strains of kidney beans were maintained in small plots. The established lines of *mat-pè*, *pèdisein* (bright seeded) and *pèyin* were also multiplied. Otenashi bean was also grown.

Maize.—Hickory King maize gave a very poor germination and only a small amount of seed could be harvested.

Linseed (*Linum usitatissimum* Linn.).—Twenty-eight strains were under trial. Of these five pure lines were tested for yield but failed to show any reliable differences. The two Pusa hybrids Nos. 21 and 68 appeared promising. Yields were generally low and it is unlikely that linseed can ever compete successfully with gram as a cold weather crop in this part of Burma.

Cactus spines.—As a result of enquiries by firms in England for cactus spines for manufacture into gramophone needles samples of spines from Prickly Pear (*Opuntia spp.*) were sent to England and were found satisfactory for the purpose. A price was paid for the spines sufficient to yield a good profit to those collecting them from waste places. As a result three firms are now purchasing spines from Burma and a small trade has arisen from what was formerly a weed of no value.

Statistics.—U Tin (1), Senior Agricultural Assistant, who has received special training in statistics at Rangoon University, was appointed Statistician to deal with problems arising in work in this department. A large number of experimental results have been submitted to this section for examination and check, much of it comparatively simple work but very time-consuming. Fifteen experiments and lay-outs for the West Central Circle were dealt with, seven for the East Central Circle, twenty-one for the Irrawaddy Circle, eight for the Northern Circle, two each for the Mycologist and Myingyan Circle and one each for the Rice Research Officer and Professor of Agriculture, besides all the statistical work arising in the botanical section itself. A large accumulation of work remains on hand and is absorbing practically the whole time of the statistician.

Medicinal Plants.—With a view to exploring the possibilities of growing medicinal plants in Burma a few which it was thought might succeed were introduced. Senna (*Cassia angustifolia* Vahl.) as a late rains crop failed but grew in the cold weather and the plants commenced to flower at the end of March. Seeds were supplied to the Tenasserim, West Central, East Central, Irrawaddy and Southern Circles for trial. *Strophanthus kombe* seed from Nyassaland failed to germinate. *Urginea scilla* Stein bulbs from Cyprus are growing satisfactorily in pots and it is hoped to multiply these. Seed of *Citrullus colocynthus* (Linn.) Schrad. from Mysore has been received for trial in the coming season.

Tobacco.—A separate report on the working of the I. C. A. R. Co-operative Tobacco Research Scheme will be issued. The season was a bad one in several ways. Nurseries gave a great deal of trouble from red ant damage and loss of seedlings by damping off. As a result the supply of early seedlings was short. An attempt at mud planting on *kyun* land near Mandalay failed because of a late rise in the river which destroyed the plants. Cut worms in the fields did very severe damage necessitating complete replanting several times of some whole fields. As many as five plantings were necessary in some cases. Hand collections of cut worms were made in an attempt to reduce the losses but in spite of collections of over 6,000 per day at times the loss continued. However, by dint of repeated plantings a fair crop was obtained, but it was uneven in growth and later than desirable for flue curing.

A collection of varieties from all over Burma consisting of 166 cultures was grown. Of these some appear to be the same but a fair number are distinct types. Their classification is being proceeded with. A small area of 0·1 acre was planted with a wrapper-leaf variety, Pachoor, from Madras. This has long fairly narrow leaves and is growing well. Shade curings will be done with it and tests made to ascertain its value as a wrapper for Burmese cheroots.

II. Demonstration and Propaganda.

Nil.

III. Publication and Supply of Information.

A number of requests for the supply of seed and information from all parts of the world were complied with. The statistician carried out a large amount of work for other Sections and Circles in the Agricultural Department. A note on the moisture affinities of different paddies was submitted for publication.

IV. Administration.

I held charge of the post of Economic Botanist up to the 5th October, when I proceeded on leave for 6 months and 6 days. I spent 79 days on tour visiting Mahlaing, Pyawbwè, Yamèthin, Tatkôn, Magwe, Taungdwingyi, Allanmyo, Minbu, Shwebo, Ye-u and Amarapura. I was in charge of the duties of the Mycologist from the 30th April until 20th May 1938.

U Ba Thein, B.A.S. II, was on duty throughout the year and officiated as Economic Botanist from 6th October to the end of the year while I was on leave. He spent 91 days on tour.

U Tin (1), Senior Agricultural Assistant, was appointed to officiate in the B.A.S. II in place of U Ba Thein with effect from the 6th October 1939. He was appointed Statistician with effect from 1st April 1939 with a special allowance of Rs. 25 per month. He spent 41 days on tour and was on leave on Medical Certificate from 8th to 18th June 1938.

Mr. F. Ellis, Senior Agricultural Assistant, was on duty throughout the year. He spent 24 days on tour.

U San Maung, Senior Agricultural Assistant was transferred to this section from West Central Circle for tobacco curing work with effect from 1st February 1939, for three months.

Dr. S. C. Varma was appointed Lecturer in Agricultural Botany in the B.A.S. II with effect from the 18th June 1938. He was on duty throughout the year and spent one day on tour.

Mr. N. P. Chowdhury, Senior Agricultural Assistant, was appointed Assistant Lecturer in Agricultural Botany with effect from 15th June 1938. He was on duty throughout the year and spent one day on tour.

D. RHIND,
Economic Botanist, Burma, Mandalay.

Annual Report of the Mycologist, Burma, Mandalay, for the year ended the 31st March 1939.

ADMINISTRATION.

Charge.—U Thet Su was in charge of this section up to the 30th April 1938, on which date Mr. D. Rhind took over from him and officiated as Mycologist in addition to his own duties as Economic Botanist. I took over from Mr. D. Rhind on 20th May 1938 and have held charge since that date.

Staff.—There were no changes in the staff.

Leave.—U Khin Manng, Senior Agricnltural Assistant, was on leave from 12th September 1938 to 17th October 1938; Maung Win, Preparer, from 10th August 1938 to 17th October 1938 and Maung Pe Myint, Preparer, from 1st February 1939 to 1st April 1939.

Tours.—I was on tour for 36 days, Mr. G. C. D'Souza for 61 days and U Khin Maung for 45 days in connection with the investigation of plant diseases and the collection of material for the herbarium.

CHARACTER OF THE SEASON.

The year under report was characterized by a more widespread occurrence of "rust" on wheat and the mildew disease of betel-vine. The *tauktemi* disease of onions and the *tikka* disease of groundnut appeared in mild forms only. "Yellow rust" on wheat, which was widely present during the previous years was entirely absent. The false-smut disease of paddy occurred only slightly and the presence of top-rot disease of sugarcane was not reported from any locality. The sugary disease of *pyaung* which reappeared last year, after a break of seven years, was again observed.

RESEARCH WORK.

Paddy (*Oryza sativa* L.)—(1) An experiment on the control of the brown spot disease of leaves and grains caused by *Helminthosporium oryzae* Br. de Hann was carried out at Mudôn Farm. It consisted of the following treatments:—

(*a*) Steeping seed in water at ordinary temperature for 6 hours and then in hot water at 54·0°C for 10 minutes.

(*b*) Steeping seed in water at ordinary temperature for 6 hours and then drying in hot-air oven at 55·0°C for 4 hours.

(*c*) Steeping seed in a 0·6 per cent solution of potassium sulphide for 24 hours.

(*d*) Untreated control.

Four varieties, namely A29-23; B28-12; C28-16 and E27-57 were used in the experiment. The incidence of the disease was mild in all cases and no difference due to the treatments was observed.

At Kanbalu Farm, fifty selections made from the crop of the previous year did not reveal any strain which was entirely free from the disease. The infection on the whole was very little on the Farm when compared with previous years.

In the neighbouring cultivators' fields the infection was very severe and some of the fields were not worth the expense of harvesting This may possibly be due to lack of sufficient water in these fields as there are no irrigation facilities as on the Farm.

It may also be mentioned that during the previous years it has been observed that cultivators' fields which receive sufficient water are only mildly attacked and those which receive less water are more severely affected.

(2) Diseases due to nematodes—

(*a*) "*Akhet-pet*" *disease*.—The disease was reported to be fairly widespread in certain localities in Tavoy District. The first symptom of the disease is the appearance of a flaccid brown or black stain at the point of attachment of the outermost leaf to its leaf-sheath. The discoloration soon afterwards extends both upwards and downwards slightly and as a result the leaf turns yellow and drops off. The symptoms then appear on the next full grown leaf, which is also killed. The disease, in this way goes on infecting and killing the leaves upwards, till at the time of harvesting, the flag leaf only is left. As a result the yield is considerably reduced. Unlike "Ufra" disease caused by *Anguillulina angusta* (Butl.) Goodey, the plant attains the usual height and the ear emerges normally from the last sheathing leaf. The disease is reported to be present in the Delta also.

A species of *Anguillulina* was found associated with the disease.

(*b*) "Ufra" disease was fairly widespread in the Delta. From reports received, the disease appears to be on the increase every year.

Unless measures are undertaken to control these nematode diseases, there is every likelihood of their becoming very serious and rendering the cultivation of paddy in these areas unprofitable.

A microscopic examination of the grains obtained from affected localities in Tavoy and the Delta, revealed the presence of some living and many dead parasitic nematodes on the grains, a point which has not been hitherto recorded. Thus, the control of nematode diseases of paddy may eventually lie in the treatment of seed or the use of seed from localities free from infection.

The possibility of controlling these diseases by seed treatment and the application of various chemicals to the soil will be investigated in the ensuing season.

(3) "Abdominal" spotting in rice grains—

The experiment of bagging unemerged panicles in a field of *Kalagyi* paddy, and introducing jassid bugs, *Nephotetix bipunctatus* into these was repeated this year in collaboration with the Entomologist. Only one grain with black discolouration in the "abdominal" region was found and that in a bagged control with no jassids. It appears that the jassid bug employed in the experiment is not responsible for the disease and that another insect capable of puncturing the rice grain must be sought.

Pyaung (*Sorghum dochna* Forsk.)—(a) A trial was made to find the effect of treating seed according to Professor Luthra's method on the incidence of grain smut which is caused by *Sphacelotheca sorghi* Clint. The method consists of soaking the seed in water at ordinary temperature for four hours during the morning of a day in Summer and thereafter spreading it in the sunshine till it is thoroughly dry. The treatment was carried out in the month of June. The results obtained are shown in Table I.

TABLE I.

Treatment of pyaung seed by Professor Luthra's method.

Treatment.	Per cent smutted ears.
Seed exposed to sunshine for 6 hours ...	4·4
Seed exposed to sunshine for 4 hours ...	6·6
Control—seed not exposed to sunshine ...	8·5

Temperature in sunshine on the day the treatment was carried out was as follows :—

11-30 a.m.	...	...	...	97°F
1-30 p.m.	...	...	...	100°F
3-30 p.m.	...	...	...	112°F
5-30 p.m.	...	...	...	96°F

It is expected that this method will give better results if the treatment is carried out in the month of April or May, when the temperature in sunshine is comparatively higher.

(*b*) The sugary disease caused by *Sphacelia sorghi* McRae, was more in evidence than in the previous year. About 9 per cent of ears were found affected at Mandalay.

Sugarcane (*Saccharum officinarum*).—The top-rot disease which was present on a large scale last year, was not reported from any district.

Diseased setts were sown in pots and they all produced healthy plants.

Wheat (*Triticum durum* Desf).—A very severe occurrence of rust was reported from all wheat growing localities. The loss was mainly due to *Puccinia graminis* Eriks. It was interesting to observe that *Puccinia glumarum*, which was widely present last year in all the localities was entirely absent this year.

A search in the fields for plants free from rust met with some success at Dwehla, Kyaukse District, where twenty-three such plants were observed in a field which was seriously affected. These plants had matured earlier than the rest of the crop. Seed from these plants was obtained and will be tried this year at Padu, for rust resistance.

Onion (*Allium* sp.)—The *tauklemi* disease caused by *Alternaria* sp. was fairly widespread in almost every tract in Burma, but in a milder form than in the previous year. Spraying the plants, when about one month old after transplanting with a copper sulphate solution 1 : 7000 was found to be slightly beneficial. Sulphur dusting was found to be of no value. During the next season the effect of higher concentrations of copper sulphate solution, that is 1 : 5000 and 1 : 2500, to control the disease will be tested.

Betel-vine (*Piper betle* L.).—(*a*) Mildew caused by *Oidium* sp. was fairly serious in most places. An experiment conducted at Kyaukse indicated the beneficial effect of 0·5 per cent suspension of "Ialine" Colloidal Sulphur which was sprayed on plants. The incidence of mildew on the sprayed plants was reduced from 17·96

per cent to 10·35 per cent while it was found to increase in the unsprayed plot from 17·27 per cent to 44·78 per cent within a month. Other treatments were not so beneficial. The following treatments were carried out :—

1. Spraying with " Sulsol " solution, 10 cc. per gallon.
2. Spraying with " Shirlan " solution, 1 oz. per 4 gallons.
3. Spraying with " Ialine " Colloidal Sulphur, 0·5 per cent.
4. Spraying with " Ialine " Colloidal Sulphur, 0·25 per cent.
5. Control—plants not sprayed.

Sprayed solution used was at the rate of 1 gallon per 10 plants.

The results are shown in Table II.

TABLE II.

Effect of various treatments on the control of Betel-vine Mildew.

Treatment.	Per cent infected leaves before spraying.	Per cent infected leaves one month after spraying.
Sulsol	11·20	13·86
Shirlan	10·41	39·85
0·25 per cent Colloidal sulphur	11·55	11·28
0·5 per cent Colloidal sulphur	17·96	10·35
Control	17·27	44·78

(*b*) Foot rot caused by *Phytophthora colocasiae* Rac.—Application of 1 per cent Bordeaux mixture was tried on betel-vine plants at the time of pulling down for renovation at Kumè. The treatment was repeated once every month for a period of 4 months. At the end of the period the percentage infection in the treated plot was 2·8 and in the untreated control plot 22·8.

Edible fungi.—(1) Straw mushroom (*Volvaria diplasia* Berk.) continued to be popular among amateur growers and cultivators. Six hundred and thirty-four bottles of *Theikpan* spawn were issued during the year compared with 514 in the previous year.

(*a*) Spawn made from Lower Burma mushrooms when inoculated into beds gave higher yield than the one from Upper Burma mushrooms, in Lower Burma.

(*b*) An experiment conducted to find out the optimum water requirements of the beds showed that watering beds both morning and evening during dry periods with two gallons of water each time gave a better yield.

(*c*) The comparative effect of adding powdered seed of *pesinngon* *Cajcanus indicus*) and gram (*Cicer arietinum* L.) to beds was tested in five experiments and it was found that the yield from beds to which

inngon or gram was added, was more than that from untreated beds. e production of mushrooms was also much earlier in the treated ls. The results are given in Table III.

TABLE III.

Effect of Pèsinngon *and Gram on yield of mushrooms.*

Date beds made.	Treatments.		
	Pèsinngon.	Gram.	Untreated.
(1)	(2)	(3)	(4)
	lbs.	lbs.	lbs.
h August 1938	2·3	1·7	1·2
September 1938	1·6	2·0	1·4
h September 1938	0·9	0·9	0·7
h September 1938	1·0	0·9	0·8
. October 1938	1·2	0·8	0·8

(*d*) Addition of powdered cowdung, groundnut cake, lime and bone-eal to beds, did not give any appreciably greater yield than the treated beds.

(*e*) A disease of the beds caused by *Corticium* sp. appeared again iring the year and was kept under check by spraying 4 per cent rmalin solution into the beds. The disease was also reported from inbalu Farm, where it was responsible for entirely inhibiting the oduction of mushrooms.

2 Trials on the cultivation of the English mushrooms (*Agaricus mpestris* L.) conducted at Mandalay were not as successful as in evious years. Only a small crop was obtained from the beds.

Experiments carried out at Maymyo in the Government Botanical ardens in collaboration with the Forest Department were again ccessful. The yield from beds was as high as obtained last year.

So far, imported spawn only has been used for the inoculation of eds. Attempts will be made this year to prepare the spawn in the boratories.

Entomogenous fungus.—Experiments on the control of the rhinoceros eetle pest of coconut by means of the green muscardine fungus *letarrhizium anisopliae* Sor.), conducted at Madaya in collaboration ith the Entomologist, did not yield any conclusive results.

The experiments will be repeated in the ensuing year.

Miscellaneous diseases.—The following diseases of minor importance ere observed during the year under report :—

(*a*) "Damping off" of tobacco seedlings due to a species of *ythium* on the College Farm at Mandalay.

(*b*) Wilting of cotton plants due to *Fusarium vasinfectum* at llanmyo Farm.

(*c*) Bacterial wilt of tobacco due to *Bacterium solanacearum* mith, at Amarapura.

(*d*) The *tikka* disease of groundnut caused by *Cercospora arachidis* at Mandalay.

Among the *fungi* examined during the year the following were observed for the first time in Burma :—

Macrophomina sp. on *Areca catechu* at Madaya.
Pestalozzia sp. on *Aleurites montana* at Hsum Hsai.
Rhizoctonia sp. on *Solanum tuberosum* at Taunggyi.
Puccinia sp. on *Polygonum* sp. at Taunggyi.
Capnodium sp. on *Eriobotrya japonica* at Maymyo.
Cystopus candidus (Pers.) Lev. on *Brassica campestres* at Maymyo and Kyauksè.
Cercospora sp. on *Morus* sp. at Mandalay.
Oidium erysiphoides on *Lagenaria vulgaris* at Amarapura.

DEMONSTRATIONS AND PROPAGANDA.

The method of cultivation of the straw mushroom was demonstrated to many enquirers at Mandalay. The method of controlling the mildew disease of betel-vine by dusting with sulphur and spraying with a Colloidal sulphur suspension was demonstrated four times at Kyauksè.

Exhibits of plant diseases and mushroom cultivation were sent to the Provincial Arts and Crafts Exhibition and various Agricultural and Cattle Shows held in different Circles.

PUBLICATIONS.

No publications were issued during the year.

L. N. SETH,
Mycologist, Burma, Mandalay

Annual Report of the Entomologist, Burma, Mandalay, for the year ended the 31st March 1939.

ADMINISTRATION.

Charge.—Mr. A. Ba Te was in charge of this section throughout the year.

Staff.—The staff consisted of Mr. S. D. Williams as Research Assistant, Mr. Shumsher Singh as Assistant to the Entomologist and Mr. R. D. Mitra as Demonstrator in Entomology, the last being recruited in June with the opening of the college.

Leave.—Mr. Shumsher Singh was on leave for one month and 5 days from 16th March 1939 without Medical Certificate.

Tours.—Mr. A. Ba Te was on tour for 27 days, Mr. Williams for 22 days, Mr. Singh for 55 days and Mr. Mitra for 10 days.

CHARACTER OF THE SEASON.

The year under report was characterized by the widespread prevalence of the "Kyetthun" disease of paddy in Kanbalu, Hopin, Mohnyin, Kawlin and Hmawbi, the insect responsible being the Rice-Stem Gall-fly, *Pachydiplosis oryzae*, Wood-Mason, a new bug pest *Scotinophara cinerea*, Le Guill, first recorded in Burma on paddy seedlings in Maubin District in the Delta and Cut worms in *Kaing* lands in Mandalay and Sagaing Districts.

RESEARCH WORK.

I. *Pachydiplosis oryzae*, Wood-Mason.—Local names :—"Kyetthun," "Kyetthun-meik".

With a view to encouraging growth of tillers and counteracting the loss due to the growing shoot turning into a tube like gall, paddy-fields in Kawlin, Gyodaung and Meza were manured with varying doses of Ammonium sulphate and Nicifos No. 2. In Meza experiments paddy plants did not grow well enough to give any reliable data.

At Kawlin, randomised plots were taken and 100 lbs. Ammonium sulphate and 100 lbs. Nicifos No. 2 were applied separately per acre. As the shapes and sizes of the plots were not uniform the results might not be statistically reliable but some idea of the effect of fertilizers may be obtained.

Plot.	100 lbs. per acre of	Yield per acre.	Average.
		lbs.	lbs.
1	Ammonium Sulphate	2,150 ...	1,955.
2	Do.	1,760 ...	
3	Nicifos	1,139 ...	1,757.
4	Do.	2,375 ...	
5	Control	1,760 ...	1,771.
6	Do.	1,783 ...	

At Gyodaung, only Nicifos No. 2 was tried and here again sizes and shapes of the paddy plots were not uniform. The results were as follows :—

Plot.	Rate of manure per acre.	Yield per acre.	Average.
	lbs.	lbs.	lbs.
1	70 ...	1,686 ...	
2	70 ...	1,633 ...	1,711
3	70 ...	1,815 ...	
4	80 ...	2,150 ...	
5	80 ...	1,950 ...	1,961
6	80 ...	1,783 ...	
7	90 ...	2,467 ...	
8	90 ...	1,500 ...	2,098
9	90 ...	2 327 ...	
10	100 ...	1,727 ...	
11	100 ...	1,788 ...	1,753
12	100 ...	1,745 ...	
13	112 ...	1,426 ...	
14	112 ...	1,940 ...	1,713
15	112 ...	1,770 ...	
16	Control ...	2,1[illegible]0 ...	
17	Do. ...	1,846 ...	1,872
18	Do. ...	1,670 ...	

II. *Pempheres affinis*, Fst.—An experiment to give reliable data for estimating the correlation between the insect incidence and yield of lint was conducted on five varieties of cotton (*a*) $L_{11} \times W6$, (*b*) Rosea × (S×W), (*c*) *Wagale*, (*d*) $C_{19} \times W_5$ and (*e*) (S×W) × Dh_2.

For statistical analysis of the results further trials and observations were suggested.

III. *Helminthosporium disease or the brown spot disease of paddy.*—In collaboration with the Mycologist and with the consent of the Economic Botanist the experiments were conducted in the latter's area. It is known that simple mechanical injury can cause the disease and some bugs are associated with the distribution of the disease in other countries. For this reason, a Jassid, *Nephotettix bipunctatus*, Fb. which is common and abundant at the time paddy grain is in milk was selected for the experiment. Fifty panicles of paddy were bagged before emergence, and the bugs were introduced from time to time to allow

of any possible damage or mechanical injury they could do to the plant. It was found that the bugs remained alive from one day to a week in the bag. The bags were only removed at the harvest time and the paddy examined grain by grain and panicle by panicle by the Mycologist. There was no evidence to associate this insect with the disease.

IV. *The green fungus. Metarrhizium anisopliae trial against the Rhinoceros beetle at Madaya.*—In collaboration with the Mycologist a series of trap pits were dug and conditions favourable for the breeding of the palm beetle, *Oryctes rhinoceros* Linn., were given. Straw, cowdung and decaying palm stems and leaves were put into 36 pits 3′ × 3′ × 2′ and the contents given time to rot. Pit temperatures were taken from time to time and two strains of the fungus were inoculated by the Mycologist who considered that the temperatures in the pits would not affect the fungus adversely. The 36 pits were in groups of four in different gardens two for the two strains of fungus, one for the Mycologist's control and one for the Entomologist's control. The Entomologist's control pits were opened four times and each time a count of the insects was made before they were killed. The other three pits of the group were opened only once at the end of the experiment.

The results were as follows :—

—	Eggs.	Larvae.	Pupae.	Adults.	Total.
Entomologist's pits ...	11	518	3	1	533
Mycologist's strain 1 ...	...	1 d. 1	1 d.	6 d	9
Mycologist's strain 2 ...	2	3 tiny	...	3 d.	8
Mycologist's control ...	...	14	...	1	15

(d = dead.)

It will be noted from above that adults found in the treated pits were dead and in the control were alive, also the live grubs found in treated pits were very tiny.

Though the Entomologist's pits which were opened four times showed higher population, the Mycologist's control and treated pits hardly showed any marked difference. Further trials appear necessary.

V. *Selection of Pigeon peas with regard to immunity against the Bruchid beetle attack.*—Yearly a selection was made of those strains of pigeon peas which were least damaged by the beetle and those with more than 2 per cent attack were discontinued. The strains varied very widely and no practicable results were expected.

REPORT OF THE OCCURRENCE OF INSECTS ON PADDY.

(1) *Leptocorisa varicornis*, Fb. from Toungoo.
(2) *Schoenobius bipunctifer*, Wlk. from Mandalay.
(3) *Scotinophara coarctata*, F. from Maubin.
(4) *Pachydiplosis oryzae*, Wood-Mason from Myitkyina, Katha, Shwebo and Insein Districts.

ON SUGARCANE.

(1) *Ripersia sacchari*, Gr. from Bilin and Pa-an.

ON COTTON.

(1) *Alcides leopardus*, Ol. from Mandalay District.
(2) *Pempheres affinis*, Faust. from Meiktila District.
(3) *Aularches miliaris*, Linn. from Sagaing District.

ON PESINNGON.

(1) *Maruca testulalis*, Geyer. from Tatkôn.
(2) *Aularches miliaris*.—Linn. from Sagaing District.

ON BEANS.

(1) *Agromyza* sp. from Tatkôn.
(2) *Diacrisia obliqua*, Wlk. from Sagaing District.

ON ONIONS.

(1) Thrips from Sagaing District.

ON TOBACCO.

(1) *Agrotis ypsilon*, Rott. from Mandalay.
(2) Aphis from Mandalay

ON GRAM.

(1) *Agrotis ypsilon*, Rott. from Sagaing District.

ON PAPAYA.

(1) *Coccus hesperidium*, L. from Mandalay.

ON NIPA FRUITICANS (DANI).

(1) Bag worms from Myaungmya.

ON AVOCADO.

Shot-hole borer from Mudon.

DEMONSTRATION AND PROPAGANDA.

Exhibits of show cases of pests were put up at Maymyo Taungdwingyi, Shwezayan (Mandalay), and Yamèthin. Show cases o pests were made and supplied to various circles, the Southern Circl received 40, Irrawaddy Circle 36, Tenasserim 24, Myingyan 6 an West Central Circle 36.

A. BA TE,
Entomologist, Burma, Mandalay

Annual Report of the Sericultural Operations in Burma, for the year ended the 31st March 1939.

ADMINISTRATION.

I was in charge of the Sericultural Department throughout the year.

Mr. J. C. Talukdar was on leave for one month without Medical Certificate. Mr. K. Das Gupta spent 80 days on tour, Mr. S. C. Chakrabarty 2 days, Maung Nyun Tin 133 days, Raphael 6 days, Saw Po Kay 13 days, Saw Myat Sein 120 days, Saw Shwe Bu 61 days, Saw Sein Tun 65 days and A. Aung Min 10 days.

TRAINING.

Altogether 23 took training in rearing and reeling and in mulberry cultivation at various stations.

RESEARCH AND EXPERIMENT.

The univoltine race of Italian worms were maintained. Mulberry plants exhibiting different characters in size and shape of leaves were put down in clons for comparison in yield of leaves and feeding values.

DISEASES AND PESTS.

There was a mild outbreak of Grasserie at Kalama rearing villages, the local rearers losing more on this account than the Nursery. This happened during the last crop, about February to March when rapid and wide variations of temperature occurred.

Muscardine occurred on a few worms at Maymyo and Leiktho.

The parasitic fly, *Tricolyga sorbillans*, Wied appeared on worms at Leiktho, Thagweplo and Kalama.

The fungus diseases *Diplodia* sp. and *Corticium salmonica*, reported last year, also occurred on mulberry this year but not seriously.

DEMONSTRATION AND PROPAGANDA.

Rearing and reeling demonstrations were given at various places at Mandalay (Shwezayan), Maymyo, Rangoon, Prome, Taungdwingyi, Shwedaung and Shwebandaw. There were twelve regular propagada lecturers during the year.

MAYMYO SERICULTURAL STATION.

Total rainfall for the year was 63·21 inches (63·51). The dry bulb thermometer ranged from 50°F to 84°F and the wet bulb from 45°F to 80°F.

Staff.—Mr. J. C. Talukdar, Junior Agricultural Assistant, was in charge assisted by a fieldman, Saw Po Kay.

Mulberry.—There were 8·53 acres under mulberry, a greater portion of which was in bushes put down more than 15 years ago. Grafts were started five years ago and were growing well although they showed a great deal of variations in the character of leaves.

Seed Supply.—Altogether 14,314 layings (19,574) and 8,794 seed cocoons (600) were distributed. Fr. Borsano of Karenni and U Myat Paw of Papun still asked for supplies at least once a year, producing eggs themselves for subsequent broods.

Three hundred and fifty-one viss of cuttings were also distributed. Kalama Station was supplied with 933 stocks for grafting.

Three trainees were entertained here during the year.

MANDALAY SUB-STATION.

Total rainfall for the year was 39·40 inches (42·57). The dry bulb thermometer varied from 99°F to 67°F in the rearing room with the highest humidity of 91 per cent in September and the lowest 27 per cent in April.

The accommodation for rearing remained the same as last year.

Staff.—Mr. S. C. Chakrabarty, Junior Agricultural Assistant, was in charge.

Mulberry.—There was 1·9 acres under bush mulberry. Very little leaves was obtained in the cold season when the climatic conditions were favourable for rearing worms here and too cold at Maymyo. However a small lot each of different races were reared here during the cold weather.

Seedlings were raised from seeds for the purpose of using them for stocks in grafting.

Cold storage.—An old type of Frigidaire was still in use for hiberation of univoltine eggs. Refrigeration of some of the eggs was done at the Messrs. Dyer Meakin & Co., Ltd., Mandalay, free of charge.

Testing of threads of various races of worms was carried out here.

PAUKKAUNG SERICULTURAL STATION.

Total rainfall for the year was 60·7 inches (50·3). The dry bulb thermometer recorded 102°F as maximum and 52°F as minimum while the wet bulb thermometer ranged from 81°F to 48°F.

Staff.—Mr. K. Das Gupta, Senior Agricultural Assistant, was in charge of the station assisted by two fieldmen, Maung Nyun Tin and Raphael, the former mainly engaged in village propaganda work and the latter with the work at the nursery.

Seed Supply.—During the year 346,584 cocoons were reared and 45,560 layings or cellular seeds (39,435) were distributed. Seven thousand seven hundred and eighty viss (6,000) of cuttings were also distributed, the transport of a greater portion of this was done by elephants kindly lent by the Divisional Forest Officer, Prome. There was no alternative means of reaching some of the rearing villages during the planting season.

Mulberry.—The area of mulberry worked by the rearers was 35·75 acres of which 15 acres was the increase during the year under report. This last included 5 acres at Bilin in Thatôn District planted under the supervision of the staff of this station.

Training.—Eight trainees were entertained during the year, four Chins and four Burmans, only four took training in rearing and reeling and the other four in mulberry cultivation.

The station is well situated on a road leading into the interior where there are rearing villages.

SHWEBANDAW SERICULTURAL STATION.

The object of this station was mentioned in last year's report.

Staff.—A fieldman, Saw Shwe Bu, was in sole charge of the station. Assisted by labourers, he did all rearing and reeling, and demonstrations on bazaar days besides touring the rearing villages.

Mulberry.—There were 2½ acres of bushes here and a few grafts which were growing well. Often the mulberry plants were allowed to grow on to meet possible demand for cuttings. This affected the yield of leaf considerably.

Seed Supply.—Two hundred and fifty-nine layings (123) were supplied to rearers and 300 viss of cuttings were distributed. Here, the communication was so difficult during the rearing reason that very often a rearer after receiving a supply of layings would later produce his own layings for subsequent crops.

Training.—There were five trainees during the year as against four last year, but many were found to be half-hearted after having gone home. Five new mulberry plantations were started by rearers of which only two were well cared for.

LEIKTHO SERICULTURAL STATION.

Total rainfall for the year was 132·25 inches (164·43). The dry bulb temperature varied from 84°F to 63°F and the wet bulb temperature varied from 77°F to 60°F.

The object of this station had been mentioned in previous reports.

The rearing house, the reeling shed and the examination rooms are all situated within the Roman Catholic Mission Convent, the buildings belonging to the mission and the upkeep is met from District Council Local Funds.

Staff.—Saw Myat Sein, Senior Agricultural Assistant, was in charge of the work in the hill tracts assisted by a fieldman, Gabriel, at the nursery.

Mulberry.—As bushes, the plants did well when farmyard manure was available but cowdung was obtainable with great difficulty, as few people kept bullocks and those that kept did not pound them.

With bushes on undulating land a lot of surface washing occurred and the plants did not do so well as expected and now all were being turned into hedges. A hillock, Bothala's hill with surrounding land measuring in all about 7 acres was acquired during the year. The crown of the hillock and the terraced land on one side were planted with hedges. The remaining three acres of the slopes were ready for hedges. Grafts did not do well in this locality.

The man at Pinthela, reported to have 8 acres in last year's report had now about 10 acres growing very well.

Seed Supply.—Seven thousand three hundred and ninety-two layings (9,577) and 30 seed cocoons (1,800) were distributed during the year. In years when "taungya" paddy is good, the rearing is much less.

Training.—Four girls and a boy were given training in rearing and reeling, all from rearing villages.

LEIKTHO (THAGWEPLO) STATION.

The meteorological conditions are about the same as Leiktho though it is about 16 miles towards the interior.

Staff.—A fieldman, A. Aung Min, was kept in charge of the station and did rearing and reeling with the help of labourers.

Mulberry.—Bushes put down about 1936 were doing fairly well but were now turned to hedges. The extension reported last year had been cleared and half the area sown.

Seed Supply.—Ten thousand and sixty-one layings (1,650), 310 seed cocoons (300) and three tray-fulls of worms (about 3,800 worms) were distributed during the year.

Training.—Two girls from different rearing villages were entertained during the year.

KALAMA SERICULTURAL STATION.

The object of this station had been given in previous reports.

Staff.—A fieldman, Saw Sein Tun, was in charge of the station, being assisted in rearing and reeling by labourers.

Mulberry.—There was about an acre of bush mulberry which supplied leaves for the nursery and also cuttings to rearers. During the year another 2½ acres was put down with mulberry in the newly acquired land. The land round the rearing house was planted with grafts which were doing well.

Seed Supply.—In all 3,751 layings (3,573) were distributed among rearers at Kalama, Kyauktaung, Sedaw, Sinchidaing, Thetkemyaung, Thôngwa and Singyone villages, the villagers having reared the hybrids with considerable success.

A. BA TE,
Entomologist, Burma, Mandalay.

Annual Report of the Rice Research Officer, Burma, for the year ended the 31st March 1939.

Introduction.—This report, which is not now submitted to the Imperial Council of Agricultural Research, is shorter than those of previous years so that it may conform with the Burma Government rules regarding the length of Annual Reports.

Work connected with Rice Research is carried out on a section of the Hmawbi Agricultural Station and as in the past the work was directed mainly to (1) the breeding of new strains of rice possessing the desirable characters required by growers, millers and exporters, (2) the study of the genetics of rice, (3) investigations into the effects of soil and climate on commercial quality in rice, (4) investigations into the effects of different methods of harvesting on commercial quality in rice (5) miscellaneous investigations regarding insect pests and diseases, photoperiodism, etc , and (6) the testing of new strains on the Station and in the Districts.

Season and Crop.—The season at Hmawbi was fairly satisfactory for rice cultivation. The total rainfall was 91·40 inches, which is about four inches below the average of the last twenty years. In May—June the rainfall was above the normal, in July—August it was below normal while in September—October it was about normal.

Tillering was not very good early in the season, and this coupled with a shortage of rain towards the end of October resulted in the crop being thin on the ground and the yield being below the average. There was unusual and very heavy rain in December 1937 shortly after the previous crop was harvested and it may be possible that the low yield of the subsequent crop may be due in the part to that heavy rain which may have removed soil nitrogen by drainage. Poor tillering in the early part of the season would indicate lack of nitrogen in the soil and poor tillering was more marked this year than usual on the poorer classes of soil.

Pests and Diseases.—No serious damage was done by insect pests or fungus diseases during the year.

The rice hispa (*Hispa armigera*) appeared as usual but in smaller number than in the previous year. A considerable amount of time was devoted to the study of the rice gall fly (*Pachydiplosis oryzæ*) which causes what is popularly known as "onion leaf" disease on account of the long cylindrical gall that is formed on affected plants. This pest does not at present do serious damage but it has also been recorded elsewhere in Burma and is important in some parts of the United Provinces in India.

In affected plants examined under the microscope by me in September colonies of what appeared to be very small hymenopterous parasites were found in association with *Pachydiplosis oryzæ*. Specimens were then sent to the Entomologist, Mandalay, who forwarded them to the British Museum, where they were identified as *Platygaster oryzæ* Cam. (family *Seclionidæ*).

The rôle of this hymenopterous parasite in the possible control of *Pachydiplosis oryzæ* requires careful study as it may be of importance.

There was no case of False Smut (*Ustilaginoidea virens*) during the year and the incidence of this disease appears to depend largely on the weather conditions at the time the paddy crop flowers. The appearance of the disease appears to be associated with wet, dull and cloudy weather at the time the paddy is in flower.

Staff.—I continued to hold charge of the post of Rice Research Officer during the year and Mr. R. M. Row, B.A.S. II, was Assistant Rice Research Officer throughout the year. U Thein Aung, B.A.A.S., was Research Assistant, except for the period from 15th August to 12th December 1938 when he was on sick leave and the post was held by U Aung Myint, Senior Agricultural Assistant, who was transferred from the West Central Circle for training in paddy work. The four posts of Fieldmen were filled as in previous years.

Breeding.—This work was continued on the same lines as in previous years, the main object being to produce high yielding strains of good quality for the various export markets. During the year 369 hybrid cultures each consisting of 300 to 500 plants were under study as shown in Table I and 69 cultures of crosses from F_8 to F_{13} generations were under yield tests.

TABLE I.

Number of cultures. (1)	Reference symbols. (2)	Generation. (3)	Parent Strains. (4)	Origin of Parents. (5)
8 ...	Xv ...	F_5	Byat × Blue Rose ...	Local-American
7 ...	Xr ...	F_6	C15-10 × D17-88 ...	Local-local.
126 ...	Xq ...	F_6	A28-6 × C15-10 ...	Do.
51 ...	Xp ...	F_6	D29-166 × A28-6 ...	Do.
4 ...	Xs ...	F_6	D17-88 × B26-12 ...	Do.
2 ...	Akyab X	F_7	Zambwet × Blue Rose	Local-American
20 ...	Xo ...	F_8	C15-10 × Blue Rose ...	Do.
3 ...	XoB ...	F_4	C15-10 × XoF$_3$ ...	(Back cross).
27 ...	Xe ...	F_{11}	Honduras × A16-34 ...	American-local.
25 ...	Xf ...	F_{11}	A16-34 × Fortuna ...	Local-American
35 ...	Xk ...	F_{11}	D17-88 × Aikokku ...	Local-Japanese.
10 ...	XkB ...	F_3	D17-88 × XkF$_6$ ...	(Back cross).
44 ...	Xa ...	F_{12}	C15-10 × C19-26 ...	Local-local.
3 ...	X ...	F_{14}	C15-10 × C14-8 ...	Do.
1 ...	X36-1	F_6	Tamasari × Texas Prolific.	New South Wales.
3 ...	X36-7	F_6	D29-166 × Letywezin	Economic Botanist, Mandalay.

Field and laboratory data were recorded as in previous years for each culture and milling tests were carried out by means of a small Minghetti machine obtained from Italy. A short summary regarding each cross is given below :—

XrF_5 (Byat × Blue Rose).—Eight cultures were under study during the year. Vigour was fairly good and there was no sterility and partial sterility. The plants however matured too early and the grain was generally of indifferent quality being soft and somewhat chalky. Three single plant cultures were retained.

XrF_6 (Ngasein C15-10 × Midon D17-88).—Seven cultures were under observation and twelve single plant selections were made. All have a good bold C type of grain and are early.

XqF_6 (Emata A28-6 × Ngasein C15-10).—This is one of the best crosses under observation and 126 cultures were under study during the year. Segregation is still taking place in the cultures but all possess a good bold translucent *Ngasein* type of grain. Vigour in the field was generally good and there were early and late maturing cultures. Ninety-one single plant cultures were retained.

XpF_6 (Kalagyi D29-166 × Emata A28-6).—Fifty-one cultures were under study and many of them were as tall as the D29-166 parent, which may be a drawback for Lower Burma conditions. Segregations was still taking place for grain size, shape and translucency as well as for other characters. Good bold D types of grain were obtained which were more translucent than D type parent. Twenty-one single plant cultures were retained.

XsF_6 (Midon D17-88 × Yathale B26-12).—Four cultures were under study and vigour in the field was good. The grain is generally a small *Ngasein* but segregation is still taking place. In point of quality the grain is not so good as in some other crosses but the cultures are early and a good early *Ngasein* to replace *Kale* may be obtained from this cross. Four single plant cultures were retained.

Akyab F_7 (Zambwet × Blue Rose).—Two cultures were under study and both were discarded. The grain though very large and round was rather dull in appearance and the cultures matured too early for Lower Burma conditions.

XoF_8' (Ngasein C15-10 × Blue Rose).—Twenty-three cultures including three back crosses on to C15-10 were under study. Vigour is now much better than it was a few years ago and partial sterility which was very common in early generations of this cross has been largely eliminated by rigorous selection. Segregation is still taking place and nineteen single plant cultures with good C or D type grain were retained.

XeF_{11} (Honduras × Emata A16-34).—Twenty-seven cultures were under study and eight of the cultures with a D type of grain were also under preliminary yield test. Yields were satisfactory but it was found that the cultures were not homozgous. The grain in the cultures is hard and translucent and generally of C or D type. Seventeen single plant selections were made.

XfF_{11} (Emata A16-34 × Fortuna).—Twenty-five cultures were under observation. Vigour in the field was very good and the cultures were early with, in many cases, a large bright C type of grain. Five cultures were under preliminary yield test and gave satisfactory outturns. The yield test will be repeated and fifteen single plant cultures were retained for further study.

XkF₁₁ (Midon D17-88 × Aikokku).—Forty-five cultures, including ten of a back cross on to D17-88, were under study and five were also in a preliminary yield test. The grain in these cultures is of the "Japan" type and in the preliminary yield test three cultures gave as good an outturn as the parent D17-88. Vigour in this cross was not quite so good as in some of the others and there has also been difficulty in obtaining homozygous cultures. Eighteen single plant selections were retained. The back cross cultures were more vigorous and twenty single plant cultures were retained. A few cultures are ready for yield test.

XaF₁₃ (Ngasein C19-26 × Ngasein C15-10).—Forty-four cultures were under observation and also yield test during the year. All cultures, except three, were homozygous and the grain, a long translucent *Ngasein*, is much the same in all cultures. The main problem now with this cross is to find out the cultures that give the highest yield. From tests carried out on the Station and at twelve centres in the Districts Xa-97 appears to be the best but during the year a culture XaF₁₁-197 appears to be better than Xa-97 or the high yielding parent C19—26.

X36-1F₆ (Tamasari × Texas Prolofic).—One culture of this cross from New South Wales was under study. The growth in the field was not very good and on that account the whole culture was discarded.

X36-7F₈ (Kalagyi D29-166 × Letywezin).—These hybrid cultures were received from the Economic Botanist, Mandalay, and have been under selection for two years at Hmawbi. X36-7F₈-367 and 368 were discarded on account of small grain of indiffrent quality. Two single plant cultnres were retained from X36-7F₈-369 but there is still segregation for grain size and shape. Vigour in the field is good but the grain is somewhat small.

X38-1F₅ (Meswe × Ngayunwa).—Grain for this culture was obtained from the Economic Botanist, Mandalay. The grain is generally a *Yathale-Emata* type, but the plants were rather late in maturing. Segregation was still taking place and three single plant cultures were retained. The grain however appears to be somewhat small.

Exotic Varieties.—The following exotic varieties were sown in observation rows during the year under report:—

TABLE II.

No. (1)	Name. (2)	Origin. (3)	Approximate life period in days. (4)	Main types in samples. (5)
1	Kæo Pin Kæo ...	Siam	193	A
2	Kæo Bang Pra ...	Do.	191	A
3	Zenobia	America ...	124	A
4	Baok	Java	...	C
5	Tai Nung 2 ...	Formosa ...	118	D
6	Faya	Nyasaland ...	175	A

TABLE II—concld.

No. (1)	Name. (2)	Origin. (3)	Approximate life period in days. (4)	Main types in samples. (5)
7	Mecan-Bino ...	Philippine Islands	188	A
8	Lead Rice ...	British Guiana ...	168	C
9	Patnai 89/549 ...	Bengal ...	165	A
10	Patnai 433 ...	Do.	168	A
11	Patnai 23 Gosaba	Do.	161	A
12	Patnai 298 ...	Do.	165	A
13	Patnai 457 ...	Do.	166	A
14	Patnai 562 ...	Do.	163	A
15	Kolumba 540 ...	Bombay ...	133	B
16	C3208	U.S.S.R. ...	100	C
17	C1704	Do.	95	B
18	C1421	Do.	103	C
19	C3214	Do.	96	C-A
20	C3204	Do.	98	Small C
21	C3209	Do.	96	Small B
22	C2315	Do.	95	C
23	C1762	Do.	92	B
24	C1720	Do.	90	Slender C
25	C3207	Do.	92	B
26	C3081	Do.	Rejected as they flowered in the nursery.	
27	C1443	Do.		
28	Pusa Type 17 ...	Pusa	166	Slender A
29	Pusa Type 24 ...	Do.	154	Bold C
30	Siam 551	Siam	146	Small A
31	Siam 552	Do.	138	Do.
32	Siam 553	Do.	128	Do.

Both the varieties from Siam showed very good vigour in the field during the growing season and were retained for further breeding work on account of the good quality of their grain. Zenobia was also retained on account of its good A type of grain though the field growth was not

good. Baok from Java though showing segregation was also retained for selection work. During the year under report, Tai Nung 2 was found to have poor germination with fair growth in the field, but will be tried again in the coming year. Faya from Nyasaland and Mecan-Bino from Philippine Islands showed as good vigour in the field as last year and were retained as they possess good quality A type of grain. Lead Rice with a dull C type of grain and fairly good field growth was also retained, as it is being tested against the local Kale paddy. The six Patnai strains were in observation rows as well as yield tests on the Station and in Prome North. Yields were very good in Prome but at Hmawbi the trial did not pass the Z test, though the results appear to be promising. Most of the strains were found to be pure but a few "coloured" plants were found in two of the strains. The rice is of good quality and as the strains are early they may be suitable for the north of Prome and north of Henzada Districts where there is a small demand for this type of grain. The Burma Chamber of Commerce have pointed out that the Patnai strains should not be substituted for the A28s now under distribution. Further yield tests will be carried out with the Patnai strains next year.

The Bombay strain Kolumba is too early for local conditions and the grain is also too small for Burma markets. All the sub-tropical varieties of the U.S.S.R. matured too early, lacked vigour and were unsuitable for Lower Burma conditions. In most cases the grain was of fairly good quality, being hard and translucent with little abdominal white, but all were discarded. The Pusa types matured too early for local conditions, and the grain was of indifferent quality only, being rather dull in appearance.

The three varieties 551, 552, 553, from Siam were only fairly good but as they were obtained late in the season further observations will be made next year.

Genetics.—The main work done under genetics during the year was a continuation of what was started in the previous years, and was mainly connected with :—(1) Sterility and partial sterility in the F generations of the crosses, C15-10 × Blue Rose and C19-26 × Blue Rose, (2) The size and shape of grain in (1), (3) endosperm character in the F_3 generation of the D29-166 × A28-6 cross and (4) the more important field characters such as plant height, panicle length and tillering in the course of breeding work.

(1) *Sterility and Partial sterility in the C15-10 × Blue Rose and C19-26 × Bule Rose crosses, F_3 genertions.*—Plants grouped at 5 per cent intervals for fertility have been studied since the F_2 generation in these crosses and it is evident that sterility and partial sterility are governed by the interaction of many complex factors that are difficult to determine purely by breeding methods. On account of the different phenotypes and genotypes that appear in later generations, gene assortments seem to take place in an unusual manner, but it is probable that sterility and partial sterility may also be due in part to chromosome abnormalities and to climatic conditions at the time of flowering. From studies in the F_2 generation of these crosses it was indicated that sterility and partial sterility were dominant over fertility, and from the economic point of view selections made from the more highly fertile plants provide suitable material for breeding work.

In practice it has been found that sterile and partially sterile plants can be largely eliminated by rigorous selection over five to six years from the F_2 generation onwards.

(2) *Size and shape of grain in C15-10 × Blue Rose and C19-26 × Blue Rose crosses, F_3 generations.*—In the F_2 populations transgressions beyond the parental limits both for length and breadth of grain was observed and there were no well defined groups for length and breadth of grain. Studies in subsequent generations have shown that both length and breadth of grain are quantitative characters which are governed by the interaction of multiple factors. In the F_3 generation cultures segregation was still taking place for length and breadth of grain.

(3) *Endosperm character in D29-166 × A28-6 cross.*—Work connected with the inheritance of endosperm character of grain in the D29-166 × A28-6 cross was still in progress at the time of the writing the report and will be included in the report of next year.

Investigations into the root systems of Rice.—As was the case last year three pure lines under distribution, *viz.*, *Emata* A28-6, *Ngasein* C15-10 and C19-26 were used for this experiment. The development of the early stages of the roots was described in last year's annual report. For purposes of study this year clean empty tar barrels about three feet in height and two feet in diameter were used as containers and filled with typical paddy soil, provision being made for drainage. The roots were washed by means of a knapsack sprayer and examined at transplanting, flowering and harvest time under both transplanted and broadcast conditions. Sowing was done on the 14th June 1938, and transplanting on 19th July 1938. General field notes on the growth, flowering dates, tillering and panicle lengths were made and the results regarding root penetration are summarised in Table III.

TABLE III.

Strain. (1)	Average lengths of roots in cms.				
	Trans-planting time.	Flowering time.		Harvest time.	
	Sown broadcast. (2)	Sown broadcast. (3)	Trans-planted. (4)	Sown broadcast. (5)	Trans-planted. (6)
A28 6 ...	21·8	51·5	49·6	39·5	43·5
C19-26 ...	30·3	56·6	48·3	45·8	43·8
C15-10 ...	34·5	49·2	48·4	39·6	44·3

At transplanting time the root penetration of A28-6 was considerably less than in case of C19-26 and C15-10 Except in the case of C15-10 the root system was slightly deeper in the broadcast than in in the transplanted series. The dry weight of roots was rather higher in the transplanted than in the broadcast series. The root system in C15-10 appeared to be somewhat more vigorous than in the other strains. No marked differences, however, were observed between the root systems of different strains.

Photoperiodism.—A preliminary experiment was carried out during the year to try to find out the effects on the rice plant of different periods of exposure to day-light and darkness. Three pure lines, *viz.*

A31-12, A28-8 and C15-10 were used for the test because their life periods differ fairly widely under normal conditions as shown below. Six plants of each pure line were divided into three lots and treated as follows :—

(*a*) *Control.*—Grown in the open and exposed to normal day-light and darkness during the normal growing season (June—November). The amount of day-light during the period varied from about 11—13 hours daily.

(*b*) Ten hours exposure daily to day-light, from 7 a.m. to 5 p.m., and the plants were kept in a dark room during the remainder of the 24 hours day.

(*c*) Eight hours exposure daily to day-light, from 7 a m. to 3 p.m., and the plants were kept in a dark room for the remaining period of the 24 hours day.

The effects on the life period in days of the strains exposed daily to different periods of darkness and day-light are shown in Table IV.

TABLE IV.—*Life period in days.*

Strain. (1)	Control. (2)	Ten hours per day of day-light. (3)	Eight hours per day of daylight. (4)
A31-12	114	71	71
A28-8	160	71	68
C15-10	180	78	78

In the treated series all the plants flowered at about the same time and in the case of A28-8 and C15-10 the plants matured in less than half the normal period. In all cases the plants exposed to ten hours and eight hours daylight were shorter, with shorter panicles, than the controls. In some cases tillering was higher in the "treated" series than in the control, but this was not a marked characteristic. No abnormalities were observed in any of the plants and all set grain normally though the yields of grain were generally less in the "treated" plants than in the control.

The results of this experiment may help to explain in part why sub-tropical varieties do not suit the tropical conditions of Lower Burma. All sub-tropical varieties when grown in Lower Burma matured in about 90—100 days and they are stunted in growth. The differences in the duration of daylight in the tropics and sub-tropics may be one of the reasons for the unsuitability of sub-tropical varieties for cultivation in the tropics. From the practical point of view the results indicate a method by which strains can be made to flower at the same time for making cross pollinations in breeding work. This subject will be studied further in the coming year.

Investigations into the Effects of different Dates of Harvesting on the Quality of Rice.—The experiment to find out the best time for harvesting the pure lines, at present under distribution from the Hmawbi Agricultural Station, is now in the fourth year.

The varieties used for the experiment were the same as in previous years. After harvest the samples of each treatment were divided roughly into two lots, one lot being dried in the sun and covered over at night for three days and the other lot was shade dried for seven days.

After threshing and winnowing, the grain was stored till the month of February which is the main milling season, when laboratory examinations for sun cracking, hulling, weight of 1,000 grains, husk percentage and bushel weights were carried out. The data recorded for the current year are shown in Tables V and VI.

TABLES V.—*Samples dried in Sun.*

Table showing results obtained in laboratory investigations.

Strains. (1)	Flowering date. (2)	Interval between flowering and harvesting. (3)	Sun cracked grain per cent. (4)	Outturn of whole rice per cent (5)	Bushel weight in lbs. (6)	Weight of 1000 grains in grms. (7)	Husk per cent. (8)
		Days.					
A28-6	30-10-38	20	36·6	55	43·0	32·75	21·28
		25	45·5	50	44·0	33·80	21·54
		30	62·2	45	44·0	33·74	21·34
		35	76·5	30	43·6	33·49	21·89
B24-92	1-11-38	20	13·2	55	45·8	26·06	21·10
		25	16·6	60	46·1	26·39	20·95
		30	27·0	55	47·0	26·54	21·51
		35	30·2	45	46·6	26·19	21·72
C24-71	31-10-38	20	10·8	60	46·6	29·90	22·01
		25	5·7	65	47·0	30·18	22·01
		30	8·1	60	47·6	30·20	22·61
		35	9·7	60	47·1	30·36	22·79
C15-10	19-11-38	20	17·0	50	46·3	30·10	20·36
		25	21·3	50	46·5	29·58	20·18
		30	31·2	40	47·1	29·54	20·11
		35	60·3	40	47·5	30·25	20·76
D17-88	6-11-38	20	37·4	60	49·5	32·83	20·86
		25	28·2	65	49·6	33·04	20·25
		30	30·2	60	50·3	33·38	20·52
		35	46·8	55	50·1	33·29	20·76

TABLE VI.—*Samples dried in Shade.*

Table showing results obtained in laboratory investigations.

Strains. (1)	Flowering date. (2)	Interval between flowering and harvesting. (3)	Sun cracked grain per cent. (4)	Outturn of whole rice per cent. (5)	Bushel weight in lbs. (6)	Weight of 1000 grains in grms. (7)	Husk per cent. (8)
		Days.					
A28-6	*30-10-38*	20	5·8	65	43·3	32·66	21·43
		25	22·9	65	44·0	33·15	20·82
		30	44·4	55	45·0	33·69	21·76
		35	66·7	35	44·5	33·47	20·91
B24-92	1-11-38	20	5·5	60	46·0	26·24	21·49
		25	14·1	65	46·5	26·68	21·29
		30	15·4	60	47·1	26·59	21·81
		35	29·4	50	47·0	26·71	21·93
C24-71	31-10-38	20	6·5	65	47·1	29·81	22·55
		25	3·7	70	47·8	30·15	21·96
		30	6·7	65	48·0	30·34	22·58
		35	7·8	65	47·5	30·06	22·03
C15-10	19-11-38	20	12·0	60	46·0	30·62	21·46
		25	12·7	60	46·5	29·82	21·13
		30	24·8	55	47·5	30·49	20·60
		35	44·7	50	47·5	30·42	21·36
D17-88	6-11-38	20	10·7	65	49·5	32·92	20·86
		25	24·6	70	50·0	32·80	20·04
		30	27·8	70	50·5	32·95	20·39
		35	30·8	65	50·3	33·06	19·96

Sun cracking.—Sun cracking again increased as the interval between flowering and harvesting increased in most cases. This was most prominent in the samples harvested at 30 and 35 days interval. Percentages of sun-cracked grain in the strains A28-6, C15-10 and D17-88 were again higher than in the strains B24-92 and C24-71. This confirms the results of the previous years. Sun cracking also took place on the standing crop when harvesting was too late. As in the previous years, the percentage of sun cracking in sun dried samples was much higher than in shade dried samples.

Hulling.—Hulling was done with the Minghetti rice huller. As in previous years, there was a negative correlation between the amount of sun cracked grain and outturn of whole rice in milling. In 20 days samples, hulling percentage was rather poor though sun cracking was low. This may be due to the softness of the kernel. The shade dried samples gave higher outturns of whole rice than the sun dried samples. Bright samples were obtained in the milling process from the grain harvested at the intervals of 30 and 35 days specially in the long lived strains C15-10 and D17-88. In the case of the shorter lived strains, A28-6, B24-92 and C24-71, 30 days samples gave a bright white rice sample in the milling. Samples of rice from plots harvested at 20 days after flowering were all dull in appearance.

The percentage of immature grains was high in the samples reaped at the intervals of 20 and 25 days. As in previous years, the late maturing strains C15-10 and D17-88 gave higher percentages of immature (green) grains than the short lived strains, A28-6, B24-92 and C24-71.

TABLE VII.—*Percentage of Immature (green) Grains.*

Strains.	Interval between flowering and harvesting.			
	20 days.	25 days.	30 days.	35 days.
(1)	(2)	(3)	(4)	(5)
A28-6	18·00	11·15	5·15	1·80
B24-92	17·95	8·75	4·15	1·85
C24-71	18·95	8·60	6·65	2·45
C15-10	25·10	17·70	12·90	3·10
D17-88	26·15	18·85	9·85	4·00

There were no significant differences within the strains for different treatments as regards bushel weight, weight of 1,000 grains, husk percentage and loss of moisture in sun drying. The significant differences in bushel weight between the different strains are due to differences in the size and shape of grain. The weights of 1,000 grain varied from last year's results and this may be due to the season.

Conclusion.—Taking all the data such as sun cracking, hulling percentage, yield and appearance of white rice samples into consideration, harvesting at the interval of 30 days after flowering combined with shade drying again gave the best result for most of the strains under test.

Yield Tests.—Nine yield tests comprising 87 strains were carried out on the Station, and two yield tests comprising sixteen strains were carried out at eighteen centres in the Districts in collaboration with the Deputy Directors of Agriculture. All tests were laid out in the form of randomised blocks or Latin squares, except test No. 5 which was laid out in the form of a balanced lattice square design. The main advantage of the balanced lattice square design over randomised blocks is that a direct comparison can be made between a larger number of strains than with randomised blocks. In test No. 5, twenty-five strains were tested in one experiment but if the randomised block layout had been used two separate tests would have been necessary. It should be noted however that strains that mature at different dates should not be included in the same test otherwise the water conditions will not be suitable for all the strains under test. This is a limitation to the use of the balanced lattice square design. Summaries of the results of the yield tests are given below.

Yield Test No. 1.

Average Yield.	XoF_7-98.	XoF_7-99.	XoF_7-101.	XoF_7-109.	D17 88.	C15-10.	Mean.	Standard Error.
	A	B	C	D	E	F		
Yield per acre in lbs.	1,618	1,522	1,695	1,639	1,607	1,641	1,620	27·73
Yield per cent ...	99·9	93·9	104·6	101·2	99·2	101·3	100	1·71

Passed 5 per cent Z test. Critical Difference = 81·79 lbs. per acre. (P = 0·05)

C F D A E B

Yield Test No. 2.

Average Yield.	XeF_{10}-113.	XeF_{10}-114.	XeF_{10}-115.	XeF_{10}-116.	XeF_{10}-117.	XeF_{10}-118.	XeF_{10}-119.	XeF_{10}-120.	A16-34.	D17-88.	Mean.	Standard Error.
	A	B	C	D	E	F	G	H	I	J		
Yield per acre in lbs.	1,522	1,436	1,296	1,600	1,450	1,387	1,223	1,303	1,378	1,260	1,385	39·13
Yield per cent	109·9	103·7	93·6	115·5	104·7	100·1	88·3	94·1	99·5	91·0	100	2·82

Passed 1 per cent Z test. Critical Difference = 108·39 lbs. per acre. (P = 0·05).

D A E B F I H C J G

Yield Test No. 3.

Average Yield.	XfF_{10}-128.	XfF_{10}-129.	XfF_{10}-130.	XfF_{10}-131.	XfF_{10}-139.	C24-71.	Mean.	Standard Error.
	A	B	C	D	E	F		
Yield per acre in lbs.	1,970	2,012	2,195	1,865	2,027	1,953	2,003	50·79
Yield per cent ...	98·5	100·6	109·8	93·3	101·4	97·7	100	2·53

Passed 1 per cent **Z** test. Critical Difference = 149·81 lbs. per acre. (P = 0·05).

C E B A F D

Yield Test No. 4.

Average Yield.	XkF_{10}-149.	XkF_{10}-153.	XkF_{10}-159.	XkF_{10}-162.	XkF_{10}-163.	D17-88.	Mean.	Standard Error.
	A	B	C	D	E	F		
Yield per acre in lbs.	1,555	1,468	1,829	1,612	1,461	1,526	1,575	41·17
Yield per cent ...	98·7	93·2	116·1	102·4	92·8	96·9	100	2·61

Passed 1 per cent Z test. Critical Difference = 121·44 lbs. per acre. (P = 0·05).

C D A F B E

Yield Test No. 5.

Average Yield.	XaF_{11}-168.	XaF_{11}-169.	XaF_{11}-170.	XaF_{11}-171.	XaF_{11}-172.	XaF_{11}-173	XaF_{11}-174.	XaF_{11}-175.	XaF_{11}-176.	XaF_{11}-177.	XaF_{11}-178.	XaF_{11}-179.	XaF_{11}-180.	XaF_{11}-181.
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Yield per acre in lbs.	1,163	1,518	1,346	1,479	1,367	1,183	1,355	1,353	1,167	1,427	1,229	1,429	1,293	1,256
Yield per cent	85·1	111·0	98·5	108·2	100·0	86·5	99·1	99·0	85·4	104·4	89·9	104·5	94·6	91·9

Average Yield.	XaF_{11}-182.	XaF_{11}-183.	XaF_{11}-184.	XaF_{11}-185.	XaF_{11}-186.	XaF_{11}-187.	XaF_{11}-188.	XaF_{11}-189.	XaF_{11}-190.	XaF_{11}-191.	C19-26.	Mean.
	O	P	Q	R	S	T	U	V	W	X	Y	
Yield per acre in lbs.	1,526	1,240	1,024	1,250	1,633	1,670	1,461	1,358	1,395	1,523	1,518	1,367
Yield per cent ...	111·6	90·7	74·9	91·4	119·5	122·2	106·9	99·3	102·0	111·4	111·0	100

Passed 1 per cent Z test. Critical Difference = 144·0 lbs. per acre. (P = 0·05)

T S O X B Y D U L J W E V G H C M N R P K F I A Q

Average Yield.	XaF_{11}-192.	XaF_{11}-193.	XaF_{11}-194.	XaF_{11}-195.	XaF_{11}-196.	XaF_{11}-197.	XaF_{11}-198.	XaF_{11}-199.	XaF_{11}-200.	C19-26.	Mean.	Standard Error.
	A	B	C	D	E	F	G	H	I	J		
Yield acre per in lbs.	1,434	1,410	1,593	1,527	1,618	1,823	1,566	1,543	1,395	1,528	1,544	50·15
Yield per cent	92·9	91·3	103·2	98·9	104·8	118·1	101·4	100·0	90·4	99·0	100	3·25

Passed 1 per cent Z test. Critical Difference = 138·9 lbs. per acre. (P = 0·05).

F E C G H J D A B I

Yield Test No. 7.

Average Yield.	XaF_{11}-201.	XaF_{11}-202.	XaF_{11}-203.	XaF_{11}-204.	XaF_{11}-205.	XaF_{11}-206.	XaF_{11}-207.	XaF_{11}-208.	XaF_{11}-209.	C19-26.	Mean.	Standard Error.
	A	B	C	D	E	F	G	H	I	J		
Yield per acre in lbs.	1,517	1,331	1,392	1,475	1,590	1,507	1,633	1,474	1,702	1,673	1,529	37·01
Yield per cent	99·2	87·1	91·0	96·5	103·9	98·6	106·8	96·4	111·3	109·4	100	2·17

Passed 1 per cent Z test. Critical Difference = 102·5 lbs. per acre. (P = 0·05).

I J G E A F D H C B

Yield Test No. 8.

Average Yield.	XaF_{11}-210.	XaF_{11}-211.	XF_{13}-212.	XF_{13}-213.	XF_{13}-214.	C15-10.	Mean.	Standard Error.
	A	B	C	D	E	F		
Yield per acre in lbs.	2,009	1,659	1,698	1,556	1,909	1,887	1,786	38·77
Yield per cent ...	112·5	92·9	95·1	87·1	106·9	105·7	100	2·17

Passed 1 per cent Z test Critical Difference = 114·4 lbs. per acre. (P = 0·05)

A E F C B D

Yield Test No. 9.

Average Yield.	Patnai Gosaba 23.	Patnai 457.	Patnai 562.	Patnai 433.	Patnai 89—549.	Patnai 298.	A16-34.	A36-3.	Mean.	Standard Error.
	A	B	C	D	E	F	G	H		
Yield per acre in lbs.	1,807	1,540	1,597	1,655	1,575	1,680	1,516	1,706	1 634	
Yield per cent ...	110·6	94·2	97·7	101·3	96·4	102·8	92·8	104·3	100	

Did not pass Z test.

Yield Test No. 1.—This was a preliminary trial to obtain an estimate of the probable yields of the C15-10 × Blue Rose hybrid cultures. Most of the cultures gave much the same yield as the local parent, but they are not fixed yet. The grain was of good quality, and the cultures were early.

Yield Test No. 2.—Eight cultures of Honduras × A16-34 cross were tested against the parent A16-34 and also D17-88. The grain in these cultures was of the Japan type and therefore D17-88 was included as one of the controls. With the exception of XeF_{10}-120, 15 and 119 all the cultures were definitely better or much the same as the two controls as regards yield. Some of the cultures, however, were not homozygous.

Yield Test No. 3.—Five cultures of A16-34 × Fortuna cross were tested in a Latin square against C24-71, a high yielding *Ngasein* strain with fair quality rice and of the same life period as those cultures. The yields in all cases were very satisfactory compared with the control, but the test will be repeated.

Yield Test No. 4.—Cultures from the D17-88 × Aikokku cross have been tested for yield for the last two years. During the year under report five of the best cultures were put down in a Latin square with D17-88 as control. XkF_{10}-159 gave a significantly higher yield than the control while the yields from other cultures were not significantly different from the control. All cultures have "Japan" type of grain, and it appears that they require good soil to give the best results, which is a characteristic of the parent D17-88.

Yield Test No. 5.—This test, carried out in the form of a balanced lattice square, comprised twenty four cultures of the C15-10 × C19-26 cross and C19-26 as control. Nine cultures namely, XaF_{11}-186, 182, 191, 169, 171, 188, 179, 177 and 190 gave statistically much the same yield as the parent C19-26, while one culture XaF_{11}- 187 was found to be a definitely higher yielder than C19-26. Eight cultures, XaF_{11}-181, 185, 183, 178, 173, 176, 168 and 184 were discarded after two years' test on account of comparatively poor yield.

Yield Test Nos. 6 and 7.—These tests comprised nine cultures each from the C19-26 × C15-10 cross laid out in a 10 × 6 randomised block arrangement with C19-26 as control. XaF_{11}-196, 194, 198, 199, 195 and 192 gave statistically much the same yield as the control in yield Test No. 6. XaF_{11}-197 was found to be a definitely higher yielder than C19-26. XaF_{11}-193 and 200 were discarded on account of low yields. In Yield Test No. 7 cultures No. XaF_{11}-205, XaF_{11}-207 and XaF_{11}-209 gave yields not statistically different from C19-26, while the yields from the other cultures were much less. Cultures XaF_{11}-202 and 203 were discarded for poor yield.

Yield Test No. 8.—This test was in the form of a 6 × 6 Latin square comprising two cultures from the C15-10 × C19-26 cross and three cultures from C15-10 × C14-8 cross with the common parent, C15-10, as control. XaF_{11}-210 was found to be a better yielder than C15-10 while XF13-214 gave much the same yield as the control. XaF_{11}-211 and XF13-213 were discarded.

Yield Test No. 9.—Six Patnai strains, namely, Patnai 23, 298, 433, 457, 562 and 89/549 were tested against A36-3 (*Hnanwar-pingauk*) and A16-34 in 8 × 5 randomised blocks. The analysis of results showed that the test failed to pass the Z test and therefore the results cannot be relied upon. A duplicate of this test was conducted at Prome, where long thin *Emata* types are generally grown and the results of the

Prome test are shown in Table VIII.

TABLE. VIII.

Yield.	Patnai 23	Patnai 89/549	Patnai 298	Patnai 433	Patnai 457	Patnai 562	A16-34	A36-3	Mean.	Standard Error.
	A	B	C	D	E	F	G	H		
Per acre in lbs. ...	2,890	2,270	2,494	2,184	2,442	2,184	1,858	2,735	2,382	162·5
Per cent	121·3	95·3	104·7	91·7	102·5	91·7	78·0	114·8	100	6·825

Passed 1 per cent Z test. Critical Difference - 470·69 lbs. per acre. (P = 0·05).

A H C E B D F G

On the whole, Patnai 23 appears to be the best of the lot though Patnai 298, 457 and 89/549 gave much the same yield as A36-3. A16-34 gave the lowest yield. This test will be repeated on the Station, at Prome and the north of Henzada where this type of grain may be in demand.

District Yield Tests.—Cultures which give satisfactory yields on the Station over two years are then tested at centres in the Districts where a given type of grain is likely to be distributed. During the year under report two yield tests were conducted at eighteen centres in the Districts as shown in Tables IX and X. In the first test eight XaF_8 cultures were tested against C19-26 and a local control in 10×6 randomised blocks at twelve centres. In the second test two XkF_8 cultures, two XfF_8 cultures and one XeF_8 culture with D17-88 as control were tested in 6×6 Latin square at six centres.

At all twelve centres the Xa cultures under test gave much the same yield as the parent C19-26 and taking the results at Hmawbi and in the Districts over the last two years Xa-97, now under distribution, has given as satisfactory results as any of them. Another culture XaF_{11}-197, however, appears from Hmawbi results to be superior to Xa-97 and it will therefore be tested in the Districts in the coming year. In the District yield test No. 2 the Xk cultures were not very satisfactory but better cultures of this cross are now available for test from Hmawbi. The two Xf cultures gave good results and will be tested further.

TABLE IX.—*Results of District Yield Test No. 1.*

Centres. (1)	XaF₇-97. Yield per acre. (2)	XaF₇-97. Per cent. (3)	XaF₈-131. Yield per acre. (4)	XaF₈-131. Per cent. (5)	XaF₈-132. Yield per acre. (6)	XaF₈-132. Per cent. (7)	XaF₈-134. Yield per acre. (8)	XaF₈-134. Per cent. (9)	XaF₈-136. Yield per acre. (10)	XaF₈-136. Per cent. (11)	XaF₈-142. Yield per acre. (12)	XaF₈-142. Per cent. (13)	XaF₁₀-202. Yield per acre. (14)	XaF₁₀-202. Per cent. (15)
	lb.		lbs.		lbs.		lbs.		lbs.		lbs.		lbs.	
1. Myaungmya	1,925	106·5	1,829	101·2	1,671	92·4	...	...	1,897	104·9	1,904	105·3	1,646	91·1
2. Pyapôn ...	2,409	109·5	2,343	106·5	2,211	100·5	2,128	96·8	2,260	102·8	2,161	98·3	2,227	101·3
3. Bassein ...	1,270	100·1	1,126	88·7	1,481	116·6	1,229	96·9	1,174	92·5	1,299	102·4	1,270	100·1
4. Maubin ...	1,437	97·7	1,504	102·3	1,454	98·9	nurseries	destroyed	by floods.		1,659	112·8	1,272	86·5
5. Pegu ...	2,475	105·1	2,425	102·9	2,178	92·4	2,128	90·3	2,195	93·2	2,508	106·5	2,376	100·9
6. Waw ...	2,541	96·6	2,656	101·0	2,557	97·2	2,508	95·4	2,673	101·6	2,591	98·5	2,557	97·2
7. Kalein ...	4,125	97·0	4,587	107·9	4,076	95·8	4,571	107·5	4,373	102·8	4,010	94·3	4,290	100·9
8. Dabein ...	1,650	110·7	1,419	95·2	1,485	99·7	1,452	97·5	1,399	93·9	1,502	100·8	1,502	100·8
9. Pauktaw ...	1,533	105·9	1,371	94·7	1,533	105·9	1,492	103·0	1,473	101·7	1,513	104·5	1,473	101·7
10. Kayan ...	2,557	97·6	2,640	100·8	2,673	102·1	2,722	103·9	2,656	101·4	,492	95·2	2,524	96·4
11. Pyu ..	4,117	104·5	4,150	105·3	4,067	103·2	3,517	89·3	4,200	106·6	3,817	96·9	4,050	102·8
12. Kyauktaga ...	3,201	101·8	3,069	97·6	3,019	96·1	3,168	100·8	3,201	101·8	3,267	103·9	3,349	106·6

Centres. (1)	XaF₁₀-204. Yield per acre. (16)	XaF₁₀-204. Per cent. (17)	C19-26. Yield per acre. (18)	C19-26. Per cent. (19)	Local control. Yield per acre. (20)	Local control. Per cent. (21)	Mean Yield per acre. (22)	Standard Error (on mean). Per acre. (23)	Standard Error (on mean). Per cent. (24)	Critical Difference per acre (P = 0·05). (25)	Remarks. (26)
	lbs.		lbs.		lbs.		lbs.	lbs.			
1. Myaungmya	1,954	108·1	1,827	101·1	1,618	89·5	1,808	66·3	4·10	189·58	Passed 1 per cent Z test.
2. Pyapôn ...	2,293	104·3	2,062	93·8	1,897	86·3	2,199	86·5	3·93	249·85	Passed 5 per cent Z test.
3. Bassein ...	1,396	109·8	1,291	101·7	1,151	90·7	1,270	63·5	5·00	183·40	Passed 1 per cent Z test.
4. Maubin ...	1,492	101·5	1,363	92·7	1,580	107·4	1,470	71·0	4·82	203·70	Xassed 5 per cent Z test
5. Pegu ...	2,541	107·9	2,376	100·9	2,358	100·1	...	...	...	...	Did not pass the Z test
6. Waw ...	2,591	98·5	2,871	109·2	2,755	104·8	...	...	...	...	Do.
7. Kalein ...	3,993	93·9	nurseries	destroyed	by floods.		...	...	...	...	Do.
8. Dabein ...	1,535	103·0	1,799	120·7	1,155	77·5	1,490	84·6	5·68	234·45	Passed 1 per cent Z test.

Centres.	XkF_8-109 A		XkF_8-111. B		XeF_8-127. C		XfF_8-90. D		XfF_8-141. E		D17-88. F		Mean Yield per acre.	Standard Error on mean.		Critical Difference per acre (P = 0·05)	Remarks.
	Yield per acre.	Per cent.	Yield per acre.	Per cent.	Yield per acre.	Per cent.	Yield per acre	Per cent.	Yield per acre.	Per cent.	Yield per acre.	Per cent.		Per acre.	Per cent.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	lbs.		lbs.		lbs.		lbs.		lbs.		lbs.		lbs	lbs.		lbs.	
. Myaungmya	1,422	94·0	1,180	78·0	1,342	88·7	1,917	126·7	1,633	108·0	1,583	104·6	1,513	65·9	4·35	194·28	Passed 1 per cent Z test.
2. Pegu ...	2,460	88·7	2,557	92·2	2,607	94·1	3,003	108·3	3,151	113·7	2,854	103·0	2,772	127·7	2·73	376·69	Passed 5 per cent Z test.
3. Waw ...	2,128	97·4	1,881	86·1	1,864	85·3	2,640	120·8	2,442	111·7	2,161	98·9	2,186	107·5	4·92	317·23	Passed 1 per cent Z test.
4. Hlegu (Kalitaw).	710	84·4	825	98·1	594	70·6	1,155	137·3	924	109·9	841	100·0	841	100·0	11·86	294·06	Passed 5 per cent Z test.
5. Kayan ...	2,495	96·2	2,455	94·6	...	...	2,871	110·7	2,673	103·1	2,475	95·4	2,594	75·4	2·91	232·44	Passed 5 per cent Z test.
6. Kalein ...	3,448	102·9	3,646	108·8	3,333	99·4	3,135	93·5	3,250	97·0	3,300	98·5	3,352	...	...	...	Did not pass the Z test.

General.—The Hon'ble Minister for Agriculture and Forests paid an official visit to the Station on the 28th October 1938. The Hon'ble Minister for Commerce and a number of members of the House of Representatives also visited the Station during the year. Other visitors numbered about 400, including about 300 students and pupils from the University and Schools in Rangoon who came in organised excursions under their lecturers and teachers.

J. W. GRANT,
Rice Research Officer, Burma.

RANGOON, *the 1st May 1939.*

Report on the operations of the Markets Section of the Department of Agriculture, Burma, for the year ended the 31st March 1939.

CHAPTER I.

Staff.—I assumed charge of the Section on 19th November 1938 after an absence from it of just over 1½ years. During that period the following officers have held charge :—

15th March 1937 to 18th May 1938 ...	Mr. R. Watson, I.A.S.
19th May 1938 to 18th August 1938 ...	U Maung Maung, B.A.S., II.
19th August 1938 to 18th November 1938	Mr. J. W. Grant, I.A.S. (In addition to his duties as Rice Research Officer).

During the current year sanction for employment of an additional clerk was obtained and an appointment made with effect from 16th June 1938. Other than this the Section strength has remained unchanged.

U Hpu, Assistant Marketing Officer, attended the Fourth Conference of Senior Marketing Officers at Delhi from 11th to 14th April 1938. Opportunity was taken for him to visit grading stations for ghee at Cawnpore, oranges at Nagpur, and hides at Delhi, Agra and Calcutta.

Commodity Surveys.

Survey work by the Section in accordance with the all-India programme during the year called for only one new report, Palm Jaggery. This has been submitted. Other than this the time of the Section has been occupied in keeping up to date the 30 surveys previously submitted and in obtaining additional information required by the Central Marketing Staff in connection with these. Opportunity has however been taken to commence during the year the surveys on Sugar, Fish and fish products, Lac, and Cashewnut due under the all-India programme for submission during 1939, and to undertake further enquiry into crops of local importance as Betelnut, Chillies, Tea and *Thanat-hpet.*

The surveys already submitted are listed below :—

1. Wheat.
2. Groundnut.
3. Linseed.
4. Tobacco.
5. Milk.
6. Eggs.
7. Oranges.
8. Apples.
9. Bananas.
10. Grapes.
11. Citrus fruits other than oranges.
12. Stone and small fruits.
13. Pineapple.
14. Rice.
15. Cattle.
16. Hides and Skins.
17. Co-operative Marketing.
18. Markets and Fairs.
19. Coffee.
20. Barley.
21. Gram.
22. Rape, Mustard and Toria.
23. Coconuts.
24. Potato.
25. Ghee and Butter.
26. Maize.
27. Wool and Hair.
28. Mango.
29. Sheep and Goats.
30. Palm Jaggery (Sugar).

Intelligence Service.

In regard to quite a number of commodities the Section is now in possession of facts and figures as to supply, demand, prices, etc., which are not readily available elsewhere and there is a growing tendency for use to be made of the

service which it has to offer. Amongst other demands the services of the Section have been utilized during the year in compiling cotton returns required for official publication in connection with the Burma-Japan Trade Agreement, and in collecting and communicating wholesale prices for sugar on which arrangements for cane prices are based. Following his appointment as Secretary of the Rice Export Trade Enquiry Committee in 1936-37 the Marketing Officer has now been appointed Secretary to the Cotton Committee which in a separated Burma will replace the Indian Central Cotton Committee in administering the funds for cotton improvement available under the Cotton Cess Act of 1923.

Development Work.

Up to the end of 1938 (December) the Markets Section had attempted no development work, but with the easing off of demands from the all-India side it has now been found possible to make a preliminary move towards this. The importance of this "preliminary" development work will be appreciated when it is remembered that trading organization throughout Burma lags far behind that in India where central assembly of agricultural produce, the starting point of all marketing improvement, is largely an accomplished fact towards which no educational campaign need be directed. Burma has thus an individual disability which must be tackled before she is in a position to line up in any development programme which may be set for the provinces of India. The time has come when the situation in Burma may perhaps opportunely be reviewed in outline.

General Disability of Eastern Countries.

Under the ordered trading conditions of Western countries, certain standards of conduct and behaviour have been evolved. To these standards the various organizations engaged in trade subscribe. Weights, measures, qualities, contracts, etc., in certain form have thus achieved a more or less general recognition. In the East, where trading is more intensely individualistic, these standards are less in evidence. Trading risks are therefore greater. For these risks, payment has ultimately to be made. Experience shows that in general it is borne by the producer in the form of a reduced price.

Price Spread.

For the produce of the field the consumer, often in distant countries and with alternative sources of supply, is prepared to pay only a certain price. The grower can afford to grow only at a certain cost. Between the consumer's price and the grower's costs lies a margin from which must be paid all the services which link the grower with the consumer. Savings from this margin, where they can be effected without impairing efficiency in the services which link grower and consumer, can be used to encourage the consumer to greater consumption and the producer to greater production. The right employment of this margin is therefore all important.

Purpose of marketing surveys.

The aim of better marketing, wherever attempted, is to see that the margin between production costs and the ultimate selling price is economically employed. From this it is plain that preliminary to any marketing improvement must come a period of survey and investigation into the working of those services which absorb this margin. These surveys in regard to the main agricultural products of Burma have now in large measure been completed

From the surveys carried out it is evident that a very considerable field for work lies ahead. Business today is largely a matter of standardization, and of honesty organized not perhaps so much on grounds of abstract morality as because it enables buyings and sellings to be undertaken with a minimum of risk. The whole purpose—or very nearly the whole purpose—of better marketing is indeed to minimise risk-bearing. Standard weights, standard measures, standard qualities, known costs of handling and transport, fixed commission and the abolition of allowances, etc., are all part of a general plan for stabilizing procedure and establishing confidence between the buying and selling sides in order to reduce risks which otherwise must be paid for.

The case for Standardization.

In Burma the need for trading standards is particularly pronounced, and the surveys carried out have emphasized in the case of most commodities the waste due to non-standard practices. Except in the case of rice in Rangoon there are few crops to which are applied quality standards of more than local recognition. Even in a matter as elementary as the weights and measures of the country no standard is general and an agreement on these is a frequent preliminary to any bargaining as to price. Price reconciliation for transactions made in different areas thus becomes a matter of considerable difficulty, and may at times be possible only after special enquiry has been made into the workings of the individual areas concerned. The position with which we are faced is that of a country split up into communes, each with its own customs and standards, and all with a looseness of outlook which permits departure even from these to meet individual occasions. Local, instead of central buying, and local, in place of more widely competitive prices, are the inevitable result.

Apart from the fact that this state of affairs effectually thwarts any attempt at price correlation between the different markets of the country, so stifling healthy competition, it is not difficult to picture the confusion of thought which this can bring even in the individual market.

Outcome of non-standard trading practices.

Risks taken in weighing and measuring find their natural counterpoint in adulterations and in a demand for allowances. For these in turn further adjustments are necessary. With uncertainty as to these, risk is added to risk.

Further, with uncertainty and mistrust all round, no large buyings can be undertaken without an elaborate arrangement of safeguards and checks. For these payment has also to be made.

Nor does the harm done by the absence of standards end even here. Because of mistrust the buyings of produce ultimately become a matter of personal contact between the grower and the small purchaser. The bulking for mill consumption of small purchases made at various points and by various agencies leads almost inevitably to the mixing of varieties and qualities even if it does not encourage deliberate adulteration. Such stocks are at times difficult to dispose of.

Witnesses in their evidence before the Royal Commission on Agriculture in India (1926—28) and before the Indian Central Banking Enquiry Committee (1929-30) made frequent reference to defects in the existing methods of marketing agricultural produce in India and Burma. They drew particular attention to the low and

Disabilities of Indian produce and marketing organization.

unreliable qualities resulting, and to the difficulty of finding buyers for these under conditions of increasing competition in the world's markets. This, as the ultimate expression of weakness in marketing organization, has probably not been given the consideration it merits by those who voice the popular clamour for new markets and better prices.

The mixing of qualities and general uncertainty in regard to grades, additional to the disabilities these create in the export situation, have certain more local and intimate repercussions. The owners of bulked stocks may at times require to borrow money on these. Mixed non-standard bulks with their added element of risk must always be less acceptable as security than a standardized bulk would be. The advances available on them must therefore always be proportionately small in amount and at high interest rates.

There is a further disability inherent in non-standard stocks which is progress-limiting. Money is borrowable from Chettyars and from certain banks on the security of stored produce, but the necessity for the lender to take physical possession of this by installing a durwan discourages banks, particularly those operating mainly in towns, from lending on up-country stocks. An alternative to this assumption of physical possession by the mortagagee's agent is to place the pledged stock in possession of an independent third party whose certificate of possession and custodianship is acceptable to the lender. Such a man would usually work under licence and supervision. This plan has been followed with success in certain countries. The independent third party makes a business of his custodianship, providing himself with godown space wherein the pledged stock is deposited. Since for economy in storage he must bulk the produce received from different sources it follows that he can function only when this produce conforms to certain defined standards which permit bulking without sacrificing the interests of the individual contributor. Where established the scheme has made it possible for banks in the distant towns to lend money without undue risk or expense and therefore at reasonable rates of interest. So long as produce in Burma remains unstandardized we are however precluded from any attempts to free and cheapen money in this way.

For the state of costly insecurity in which trading is carried on in Burma the blame is variously apportioned. Sellers aver that the root of the trouble lies in the use of non-standard weights and measures and in the irregular incidence of allowances, declaring that it is in attempts to cope with these that they bring in produce insufficiently dried, winnowed and prepared, or wilfully adulterated down to the acceptance limit. In fairness to the buyer it has to be recorded that he, for his part, regards the use of a moving scale of weights, measures, and allowances as a legitimate safeguard necessary in view of the down-grading practised.

To correctly apportion responsibility between buying and selling interests would be difficult. In our search for remedial measures we are however left with no doubts as to the quarter from which these must originate. Grades, even for a single crop, are not easy to define and enforce. For the large variety of crops, scattered throughout a country like Burma, definition and enforcement of grade standards would lie outside the scope of any governmental machinery which

could be devised. On the other hand the enforcement of standards in regard to weighing and measuring, though this presents difficulties, is not a task altogether outside government's competence.

With buyers constrained to use only standard weights and measures, and to conform to defined allowances, it may be left to them to see that they are not exploited into the acceptance of low-grade stocks. The development of grade standards by the trade itself, with echeloned prices for each, may thus be expected to follow standardization of the weights and measures used.

Legislation in regard to the use of a standard unit of measure has (after discussion and debate going back a full quarter-century to the Weights and Measures Committee of 1913-14) now found its way on to the statute-book in the Measuring Basket Standardization Act passed by the Legislature last month (March 1939). Further legislation to provide for the use of standard weights is under contemplation.

The case for Regulated Markets.

But even with laws passed making compulsory the use of standard weights and measures there will still remain difficulties in supervising the application of these. For their enforcement, in transactions scattered over the countryside, an army of inspectors would be required. It is unlikely that these could be entertained in sufficient numbers or on sufficient pay to make them immune from the temptations to illegal gain which would inevitably be offered to them by interested parties. Their numbers could however be kept in check, and the efficiency of their supervision ensured, if the present practice of diffused transactions in produce could be replaced under rules by concentrations within specific demarcated areas. This is not a new principle in Burma as the Mandalay Shan-zu Quarter of the time of Burmese kings bears witness, and it has already been applied in more modern form in various parts of India where regulated markets on the Berar model have been set up. To these markets from the surrounding countryside must be brought all scheduled produce offered for sale. The markets are managed by Committees representing buyers, sellers and commission agents, together with representatives of the local sanitation authority. These market committees employ their own licensed weighmen and they license, under specific control terms, the brokers who are entitled to transact business within their confines. Licenses may be cancelled for proved misdemeanours against the buyers and sellers using the market. Since cancellation means loss of employment, and postulates removal to areas outside the committee's jurisdiction, this is a penalty not willingly incurred.

There are difficulties in setting up under Burma conditions such markets as these, particularly as the weekly bazaar habit in country districts is not general as in India. An approach to solution might be made by encouraging in Burma the adoption of the "nga-yet-ze" of the Shan States. At present this is more or less confined to districts adjacent to the Shan States and to an area in Thayetmyo district in which it has been specifically fostered. Agricultural Department Survey No. 9 of 1931 and a Note given in Appendix XI to the Report of the Banking Enquiry Committee (Burma Section) may be referred to in this connection.

That there is growing a realization that standardization of weights and measures is needed is shown by the fact that already in various parts of the country there are to be found voluntary organizations of

buyers or sellers who maintain their own approved and stamped baskets, etc., which they expect their members to use in all transactions. Amongst quite a number of broker communities too the commissions demandable are reasonably defined. These organizations however lack the authority to enforce their rules.

The encouragement of the small seller, and preferably the actual grower, into a Regulated Market should obviate much of the mixing of varieties and qualities which now goes on under conditions of assembly by peripatetic brokers. It should therefore be possible in a regulated market to assemble, in fairly large lots, bulks of a more or less even-running quality. The advantage of this from a milling or processing point of view, and later on in providing the graded qualities so essential for competing in world markets, will need no emphasizing.

It should be recorded however that the first object of the regulated market is not to improve quality but to ensure fair weighing and measuring and the removal of irregular allowances and cuts from the price offered. It is retaliations arising from these which finally are responsible for much of the adulteration and grading down found. Improvement in the quality offered should be the natural result of removing the reasons for retaliation.

Grading under a National Mark.

For opportunities for specific grading work in connection with improved marketing proposals we shall have to look first not to the assembly side but rather to the distributing. In this direction something can possibly be done (as it has been in certain countries) by the institution of " Grade Marks " approved by a central authority. The grade marks are the copyright of the central authority and licences to use them are issued only to approved retailers and on specific conditions.

For each grade, certain standards of size, colour, purity, etc., are laid down, and the licencee contracts with the central authority to observe these in all packages on which he uses the authority's licensed mark. He also contracts to use a special sub-mark by which produce can be traced back to him and agrees that this produce shall be open to inspection by the authority. The central authority maintains staff for this inspection work and has powers to proceed against the producer who, working under the authority's guarantee, fails to observe the standards by which he has agreed to be bound. In England, where a " National Mark " system has been worked with success, it has been found possible to have the inspection work done by an official marketing staff but to leave to a committee representing the trade concerned the disciplinary action which may be called for against offenders, who, whilst sheltering under and benefiting from the use of a national mark, fail to observe the standards by which all users of it have agreed to be bound.

Legislation to permit the setting up of grade standards operating under a National Mark Scheme has already been passed in India and is being applied to certain commodities.

Licensed Warehouses.

In connection with the setting up of licensed warehouses as a means of promoting cheaper finance on the security of produce stored, the objective is distant and its achievement will take time. To begin with it is unlikely that money from private sources will be available for the enterprize, and governmental assistance may be required. This could possibly

take the form of subsidies towards the cost of godown erection at certain experiment centres, or the guarantee of a moderate dividend in encouragement of those erected by private enterprize. Machinery for periodic inspection and supervision by Government of the warehouses to which it has issued licences will also be required to create and maintain confidence in the integrety of the warehouseman and the competence of his grading staff. Without this the banks will likely be unwilling to lend on stocks, and stockholders dubious of bringing in for storage.

The project of licensed warehouses, although a long-range objective, is an integral part of any comprehensive scheme for marketing improvement. It must therefore be kept in view and given its share of attention in any educational campaign in the interests of improved marketing which may be adopted.

Programme of work.

Three lines of possible work towards marketing improvement in Burma are thus envisaged.

(*a*) Standardization of weights and measures and discouragement of illegal commissions through the agency of Regulated Markets set up on the Berar model.

(*b*) The introduction of grade standards for retail produce by means of a National Mark Scheme working under a Grading Act.

(*c*) The freeing of money and cheapening of financial accomodation through provision of licensed warehouses in which goods could be stored under impartial third-party custody.

Throughout all runs the common aim of standardization to beget confidence and to cut down costs. In the absence of this, business relations, remaining on an individualistic plane, must continue wasteful of effort and expensive to maintain. Other directions wherein standardized procedure would result in saving will occur to mind. The setting up of a Licensed Board of Rice Surveyors to arbitrate on milling quality disputes, which has already been recommended by the Rice Export Trade Enquiry Committee, is one.

For the schemes set out above, legislation, funds, and staff will all be required. To suggest that they can be undertaken by an Agricultural Department which already has its hands full with the more technical aspects of its work would be absurd. Nor can it be undertaken unaided by a Markets Section which is only a small branch of the Agricultural Department.

The alternative appears to be a Marketing or Development Board representative of cultivating and trading interests and of Government. The aim of such a Board would not be price fixation and the control of marketing envisaged by some, but the encouraging and co-ordinating of schemes leading to its more orderly performance.

Under the wing of a representative and influential body of this type, a Markets Section having at its disposal the investigation results of its survey period might be able to achieve a good deal in improving marketing practices. Without that influential support no practical results from its labours are to be expected.

The scheme envisaged takes no account of new external markets, the finding of which is popularly regarded as the remedy for present

low prices. It aims instead at effecting internal economies and achieving certain standards which shall enhance our competing power in markets already known.

With a reputation built up in these our entry into new fields can be embarked upon with minimum expense and with maximum prospects of permanence.

CHAPTER II.

The approach to marketing improvement.

The objectives of a " better-marketing " movement have been given. Basic to the whole scheme is the Regulated Market with its concentration of produce at centres where standardized procedure in regard to weighing and measuring can be enforced and encouragement by way of competitive prices given for graded qualities. For the present we need not look consciously beyond these. Justification for such markets is plain, as has already been indicated, but their establishment presents difficulties. To overcome these, propaganda to accustom people to their use, and, finally, legislation to give their committees financial support and legal standing will both be necessary.

Proposals for legislation present no difficulty. The temptation to enact legislation in advance of public preparedness for it is however to be resisted.

For the setting up of Regulated Markets, as for the Standardization of Grades under a National Mark and the Control and Finance of Licensed Warehouses which are proposed developments from them, a considerable background of education will be necessary. Improvement in marketing can be expected only as this proceeds. The easing-off of the all-India demand during the past few months now permits the approach to this.

Experimental Areas.

The regulated markets which are a first step in the programme proposed will require an experiment period. For this, certain areas representative of crops and conditions in different parts of the country have been chosen as under—

(a) Lower Burma—Paddy—Kayan.
(b) Upper Burma—Paddy—Shwebo.
(c) Mid-Burma—Groundnut—Magwe.
(d) Mid-Burma—Cotton—Shwebanoaw.

During the final three months of the year under report the three Assistant Marketing Officers, whilst keeping abreast of the work which they are called upon to do in satisfaction of all-India requirements, have toured these areas continuously, making a detailed examination of conditions which bear on the schemes for marketing improvement proposed. With their questioning has gone propaganda to accustom buyers and sellers to ideas of standardization and to encourage the formation of Societies to advance it.

Market regulation by agreement.

In all areas investigation shows that for discrepancies in weighing and measuring at assembling centres the fault lies initially in the villages. In the village the customary use of different baskets for payment of rents, payment of wages, and for produce sale, and variation even of these at the whim of the individual, has induced a looseness of outlook

quite foreign to any idea of standardization. Weighings follow the same course. To the villager when taking his produce into the assembling centre, it seems therefore a quite natural happening to be offered a choice in the measures and weights to be used in accepting his produce. This is the beginning of his slide into the pit which awaits him.

Figures are not a strong point with the cultivator, and the calculation necessary to link a variation in quantity with its corresponding variation in price is usually beyond him. He thus falls an easy victim to the sharp practices of those to whom buyings and the calculations required are a matter of day to day routine.

Safety for the selling cultivator lies only in anchoring himself to a standard unit of weight or measurement. Since, in the village, there is no "standard" a first step lies in the introduction of this.

Amongst the better class of trader and broker the investigations carried out have revealed a certain re-action from the practice of varying weights and measures, which, it is argued, has been forced upon them by the tactics of less scrupulous buyers. By quite a number of better class traders and brokers the view is expressed that the adoption of a more standardized procedure would be welcome.

It would seem therefore from the enquiries made that there is no fundamental obstacle to rapprochement between buyer and seller. The situation is however one which requires handling with care since there is a section of buyers (*i.e.* those who have grown fat on the operation of non-standard practices) who may be expected to actively oppose any move towards standardization, whilst from the cultivator-seller side, steeped in its village customs, no great enthusiasms can be expected until education and propaganda have made clear to it the disabilities of those customs.

At each of the four centres chosen for experiment in marketing improvement the conditions have been found to be basically similar. A common plan of action has thus been deemed possible.

At each centre talks with influential traders and brokers have been initiated and the advantages of more standardized practice in buying explained. Encouragement has been given for the more reputable buyers, who are at present losers by sharp-practice competition, to form themselves into societies for furthering local recognition of standard measures and weights. Since the avowed object of such a society is merely the use of true and standard weights and measures it is difficult for any buyer, whatever his personal attitude towards these may be, to avoid associating himself with the society and its objects. Membership of the society is conditional on a promise to advance these objects, and, in the case of each member's individual dealings, to refrain from the use of weights, measures, etc., which are non-standard. Facilities for the purchase of standard weights, measures, etc., are given.

Amongst sellers the plan followed is to tackle these by villages. In the villages, meetings are held at which the object of standardization in weighing and measuring is explained. Village weighing and measuring apparatus of local repute is then called for and checked against standard weights and measures carried. Actual prices which have been received by villagers using local weights and measures are then worked out in terms of the price receivable if true and standard

weights and measures had been used. Offers which have been received by villagers for measures, etc., of different capacity are compared by means of price correlation charts, numbers of which are printed for distribution.

The work of enlightening the cultivator as to the disabilities which he brings upon himself by not adhering to recognized standards of weighing and measuring is slow, but it is necessary if a framework for better marketing is to be built up. An encouraging outcome has been the surrender, in varying degrees by different villages, of the weighing and measuring apparatus in current use, either for destruction or correction, and in a demand for a standard basket and standard weights to be housed in the village and made available to all who wish to use them for check purposes. So far as is possible these have been supplied, or have been promised on loan conditional, if no Agricultural Society exists in the village, on the formation of a Society.

Along with the work of establishing in each of the selected areas societies of (*a*) selling cultivators and (*b*) buyers (traders and brokers), goes the further scheme of associating representatives from both these groups in a "True Weights and Measures Committee" operating at the assembly centre of the area. Each such Committee is to be prepared to test all weights and measures submitted to it, and to stamp with its own seal those which pass the test. It also is to open a register of those buyers who have submitted their weights and measures for check by the Committee and who have agreed to use in their buying transactions only approved weights and measures. To these buyers the Committee will issue a registration certificate. It will also publish their names so that sellers may know to which buyers they may go with confidence. Further, the Committees will maintain at each market a set of standard weights and measures. On application these will be available for check against any weights and measures in use in the market. The Committees proposed are thus forerunners on a voluntary basis of those Committees which will later have to be set up under a Regulated Markets Act.

At two of the four selected centres, Magwe and Shwebandaw, which have been "nursed" for this purpose for some years prior to the existence of a Markets Section, these voluntary Committees have now been set up and are functioning.

At Kayan the work of the Committee is at present still being undertaken by the Markets Section but control by the Committee is well in sight, whilst at Shwebo, the last of the centres tackled, only the propaganda stage has been reached.

Interest in all centres appears keen and much useful experience on which to base legislation for general application is being gained.

Some realization of the scope of the work may be obtained from the following brief account of each centre.

Magwe.—This is the headquarters of the Deputy Director of Agriculture, West Central Circle. It is a natural assembling point for the groundnut crop of the Magwe Township which from here is shipped down to mills in Allanmyo, Prome and Rangoon. It is also a centre

which in the past has come in for criticism in regard to its treatment of the selling cultivator.* It has long been on the list of places selected for first experiment in improved marketing.

Propaganda carried out in 102 villages throughout the tract resulted in the formation of a somewhat nebulous "Agricultural Society" in each. Representative of these there has come into being a rather more definie body, the Magwe Taung-thu-gyi Association. This comprises tow members elected from each of the 102 villages, and is thus fully representative of the whole tract. In the Magwe area the approach towards better marking has been from this, the seller, side.

The demands from the seller side as formulated at their meetings were communicated to buyers, by whom a meeting was held to consider to what extent they where prepared to acquiesce in and advance the proposals for marketing improvement put forward. Out of this meeting a Brokers Asocssociation was formed.The local traders have also formed an Association.

Separate meetings were held with each of the three parties and points of dispute reconciled. All three parties were then called to a joint meeting held under the Chairmanship of the Deputy Commissioner in November 1937. At this joint meeting a "Magwe Marketing Committee" representative of all parties was appointed. This Committee has been actively functioning since the groundnut season opened in September 1938.

Arrivals of groundnut carts into Magwe are being recorded. These for the current season up to 18th March have totalled 23,304. A 25,000 cart entry in Magwe town by the end of the season may be assumed. This is equivalent to 5 lakh baskets of nut or approximately 9,000 tons. At Rs. 133 per 100 baskets of 40 lbs each (the price ruling in March) this (at Magwe) is worth between Rs. 6 lakhs and Rs. 7 lakhs.

Twenty-seven platform weighing machines have been submitted to the Committee for check and adjustment. The check, carried out by a Sub-Committee consisting of the Secretary and four members representing traders (2) brokers (1) and cultivators (1), showed that only 3 of the 27 machines in actual use were correctly adjusted, the error on the others (all on the side of underweighment) lying between 3 and 10 per cent. Adjustments were made and the adjusting screw wired and sealed.

For nut sold by measurement, as is the practice at the begining of the season when the nuts are not fully dried, the Committee has approved the use of a basket having the following dimensions :—

Top	...	...	...	17¾″ × 17¾″
Bottom	...	...	...	14″ × 14″
Vertical height	...	...	...	14¾″

This has a capacity of 3,613 cubic inches and is locally reckoned as holding 40 pounds F.A.Q. groundnut.

The Committee is not undertaking the check of local bamboo baskets, but is encouraging traders to give these up and use the approved type fashioned in wood. Forty of these have been made for brokers and traders and submitted for check. A further 50 have been ordered by village societies.

*Vide pp. 105-107 of "A Collection of Papers written for the Royal Commission on Agriculture, 1926."

For oil measuring, for which the Committee has approved a pot with escape holes at the 12 viss mark, 75 have been submitted for check.

Shwebandaw.—In the Thanbulla-Shwebandaw area the crop mainly dealt in is cotton. The markets at Shwebandaw and Thanbulla are not natural assembly points. They were brought into being by the Agricultural Department some 10 years ago. Their origin and purpose are described in a Note given in Appendix XI to the Report of the Banking Enquiry Committee (Burma Section) to which reference has already been made.

Beyond keeping at these centres a set of standard weights and measures (and even these were discontinued subsequent to the period of unquiet which began in 1930-31) no interference with local weighing and measuring customs was attempted until January of the year under report. It was then felt that a step forward might be attempted.

Enquiry in the villages around the two market centres had shown a good deal of dissatisfaction in the practice of *ta-lon-gyi* and *hna-lon-gyi* deliveries (i.e. 110 and 120 viss in place of the named 100 viss) and also in the instruments for weighing used. Thanbulla worked to a *hna-lon-gyi* weighing, whilst at Shwebandaw *ta-lon-gyi* deliveries had become the custom. At Thanbulla weighing was done on the "sin", a local version in wood of the steelyard, but constructed to make weighings only of a fixed weight, whilst at Shwebandaw the spring-balance (of which each jungle broker seemed to posses 2 or 3) was the accepted medium. Around both assembly points, in the villages themselves, the "sin" was the weighing instrument in normal use.

A check of a few of the instruments in use in the assmbling centres had shown clearly the abuses which these were perpetuating and the need for standardizing weighing procedure. Checks of the "sins" used in villages also had shown considerable departures from their reputed weighings.

Meetings were held therefore at various villages throughout the tract and the case for standardization discussed. To further this and to secure the abolition of *ta-lon-gyi* and *hna-lon-gyi* weighings Societies were formed in 4 village tracts, Thanbulla, Myohla, Tindaw and Shwebandaw. Each of these tract societies represented from 15 to 20 villages. As in the case of the village societies in Magwe these found ultimate expression in Central meetings at which the views of all villages and tracts were represented.

Formal resolutions passed by the Central meetings were communicated to the brokers and traders operating in the two cotton assembling centres at Thanbulla and Shwebandaw. As yet these brokers and traders have not linked themselves into any formal society.

Points of controversy were hammered out with sellers and buyers respectively, and when individual agreement to subscribe to the principles of a True Weights and Measures Committee had been arrived at a meeting under the Chairmanship of the Deputy Commissioner was held. At this meeting the "Shwebandaw and Thanbulla True Weights and Measures Committee" was formally constituted. The Committee has been functioning since 21st February 1939. A

Working Sub-Committee consisting of 3 representatives of buyers and 3 representatives of sellers, together with an Assistant Marketing Officer, and with the Deputy Director of Agriculture, West Central Circle as Secretary was subsequently appointed.

Records of arrival of *kuppas* in the markets over the period subsequent to establishment of the Committee show that the following quantities have been dealt in :—

Market Centre.	February 1939 4th week.		March 1939 1st week.		March 1939 2nd week.		March 1939 3rd week.		March 1939 4th week.	
	Kuppas in viss.	Value in Rs.	Kuppas in viss.	Value in Rs.	Kuppas in viss.	Value in Rs.	Kuppas in viss.	Value in Rs.	Kuppas in viss.	Value in Rs.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Thanbulla ...	13,000	2,275	14,700	2,573	24,700	4,322	10,400	1,778	17,800	3,293
Shwebandaw	19,500	3,315	28,500	5,130	50,700	8,257	39,050	6,639	43,900	7,463
	32,500	5,590	43,200	7,703	75,400	12,579	49,450	8,417	61,700	10,756

The season lasts only about three months but from the above figures taken from what is locally reckoned no more than a half-crop year, it will be seen that the amounts dealt with weekly have been round about half a lakh viss valued at about Rs. 8,000. In an average 12 week season the amount dealt with cannot be put at less than about 12 lakhs viss with a value exceeding two lakhs of rupees. The markets which are held only once a week must therefore be reckoned to fulfil an important local function.

In regard to the weights and measures in use the True Weights and Measures Committee has secured agreement from buyers to ban the use of spring balances at Shwebandaw and of " sins " at Thanbulla, using in their place the *va-zu* (beam balance made in wood). The possibilities for malpractice in using the spring balance may be gauged from the fact that of 20 which we persuaded the users to bring to us for check (and these it must be presumed were not amongst the worst of them) only 9 were found to register accurately, the variation of the remaining 11 lying (all on the short side) between 2 and 5 lbs. in a weighment of 10 viss (36 lbs.). In regard to the " sins " eight, each constructed for a reputed weighing of 13 viss, were checked. The check revealed weighings which went as high as 13·85 viss and in no case was lower than 13·25 viss. The average was 13·40 viss. Additional to this the " sins " checked were found to be so insensitive that unless tapped during weighing a further ¼ viss might pass unrecorded. In actual sale transactions tapping is not usually done. An error of about two-thirds of a viss is thus customary on all weighings. The mean error revealed points to losses by the seller (apart from any question of manipulation of the balances and " sins " when in actual use) amounting to about 5 per cent at Thanbulla and something over 5 per cent at Shwebandaw.

Additional to check in the markets themselves a village to village check of " sins " in use has provided the following information :—

	Shwebandaw area.			Thanbulla area.			Total.		
	No. checked.	Mean error (overweighment.)		No. checked.	Mean error (overweighment.)		No. checked.	Mean error (overweighment.)	
		In viss.	Per cent.		In viss.	Per cent.		In viss	Per cent.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5 viss " sins " ...	9	0·55	11·0	...	...	...	9	0·55	11·0
6 viss " sins " ...	...	...	...	4	0·43	7·2	4	0·43	7·2
10 viss " sins " ...	12	0·54	5·4	1	0·30	3·0	13	0·52	5·2
11 viss " sins " ...	69	0·95	8·7	4	1·35	12·3	73	0·98	8·9
11½ viss " sins " ...	...	...	...	1	1·10	9·6	1	1·10	9·6
12 viss " sins " ...	3	0·90	8·4	43	0·88	7·3	46	0·89	7·4
13 viss " sins " ...	...	...	...	8	0·40	3·0	8	0·40	3·0

Villagers are being persuaded to discontinue sellings based on "sin" weighments and in place of these to substitute weighings made with the " ya-zu," as in the market centres. For use with these " ya-zu," weights certified and stamped at the Rangoon Corporation workshops and re-stamped with the seal of the True Weights and Measures Committee have been made available.

Around Shwebandaw villagers are as yet unwilling to discard their " sins " and a compromise has had to be made by temporarily allowing the use of these to be continued after their correction to a true weighing. Ninety-three " sins " have been so corrected.

In villages around Thanbulla the discard of the " sin " in favour of the " ya-zu " has been more readily agreed to and 61 " sins " have been surrendered.

The following table shows the number of " ya-zu " and of certified weights supplied through the Weights and Measures Committee in the two areas in the 3 week period ended 31st March 1939 :—

	Thanbulla area.			Shwebandaw area.			Total.		
	To Cultivators.	To Traders.	Total	To Cultivators.	To Traders.	Total.	To Cultivators.	To Traders.	Total.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
" Ya-zu " ...	4	12	16	1	3	4	5	15	20
Weights 10 viss ...	16	10	26	10	21	31	26	31	57
5 viss ...	8	9	17	3	18	21	11	27	38
2½ viss ...	5	14	19	1	24	25	6	38	44
1 viss ...	12	9	21	4	19	23	16	28	44
½ viss ...	12	9	21	4	19	23	16	28	44

Distribution is proceeding.

Kayan.—This, like Magwe, is a natural assembly point, in this case or paddy. It is the headquarters of the Banking Union, an organization for the co-operative financing, milling, and disposal of the paddy crop of the Sittang Colonies government estate ; it is also a recognized buying centre for several of the large rice-exporting firms who mill in Rangoon. Buyings by these latter are made at established *daings.* Supply to the *daings* is assured by large numbers of intermediaries acting in the alternative capacities of broker and jungle trader.

On the *daings* buying is done by weight (token weighings). Outside the *daings* acceptance may be by measure or by weight. Weighings in the daings are made on platform weighing machines. Outside the *daings* the spring balance is used.

Paddy coming into Kayan is estimated at 50 lakh-baskets per year of which 35 lakh-baskets enter from the eastern side through a bottle neck approach known as Gongyaw. Of the 35 lakh-baskets entering through this approach it is reckoned that 5 lakh is rent-paddy entering Kayan for storage whilst 12 lakh is paddy earmarked for the Banking Union. Of the 18 lakh-baskets remaining it is estimated that paddy already purchased in the interior and being brought in for delivery accounts for 15 lakh-baskets. This leaves 3 lakh-baskets only of "free" paddy for competition amongst brokers and traders in Kayan itself. This, on a buying season lasting between 3 and 4 months, averages out at about 100 carts per day.

The competition for this is keen. Regular brokers in Kayan are reckoned to number fully 100, whilst outsiders who come into Kayan for the season probably amount to fully twice these. All, in addition to any trading they may do in the interior, share in the competition for the 3 lakh-baskets of "free" paddy which enters by way of Gongyaw.

On the *daings* the purchasing procedure by token weighings is reasonably standardized. On the fringe of the *daings* or out at the Gongyaw approach the acceptance standards used, both in weight and measure, are infinite in their variety, this variation involving calculation on which the less scrupulous of the buyers make their profits. Similar variation is to be found in the villages of the tract. Conditions at Gongyaw and in the interior thus suggested a definite need for standardization, and, after a preliminary tour of the area, its inclusion as an experiment centre in the scheme towards better marketing was decided upon.

Tours of the area had disclosed however that the approach to the problem through the medium of Village Societies as in the case of Magwe and Shwebandaw was here out of question. Villages were small and scattered, and many cultivators, nominally on the village roll, were found to live the whole year round away from the village on their own holdings. Contact was thus diffiult.

An alternative method of approach offered itself in the fact that there was in Kayan an established Brokers Association, the members of which considered themselves to be suffering loss of business and loss of reputation owing to sharp practices in weighing and measuring indulged in by the numerous outside brokers who descend upon Kayan for seasonal work. Members of the Brokers Association were thus able to appreciate the advantage which might accrue to them from the use of standard weights and measures and from an organized recognition of

them individually as users of these. Pledges were therefore fairly readily forthcoming from them to support a scheme for a True Weights and Measures Committee.

At the same time, in order to reach as many cultivators and villagers as possible in a minimum of time for the purpose of accustoming them to the purpose of standardization in weighing and measuring (the season was already well advanced when we entered here), it was decided to set up at the Gongyaw approach into Kayan a Markets Section stall from which propaganda would be carried out.

This stall was erected in mid-February and was equipped with standard weights and standard measures and with the necessary staff and apparatus for testing any measures, weights or weighing instruments which might be brought in. The stall also undertook to weigh, either by token baskets or in bulk, any paddy intended for sale brought in to it. Sales under shelter of its guaranteed weighings were encouraged.

The stall was an immediate centre of interest. Sales made under shelter of its token or bulk weighings steadily rose from 5751 baskets in February to 18,848 baskets by the end of March, an average of over 3,000 baskets per week over the 6-week period. Baskets brought in for check and adjustment have numbered 17 and spring balances 70. Of the 17 baskets submitted 1 only was of the standard 9-gallon (128 *nozibus* capacity whilst 3 showed a shortage lying between ¾ and 3½ *nozibus* and 13 an overmeasurment of between ½ and 15 *nozibus*. The average nett discrepancy was 3 *nozibus* on the side of overmeasurement.

Of the 70 spring-balances brought in for check against a 56 lbs. weight only 12 registered correctly whilst 23 showed overweighment lying between 2 ozs. and 16 ozs. and 35 underweighment of between 2 ozs. and 56 ozs. Overweighments averaged 5½ ozs. and underweighments just over 10 ozs.

For correction of the baskets submitted the services of a basket maker were engaged. The baskets after adjustment were re-checked and then sealed with a *Thamadi* seal to prevent further tampering.

For spring-balances no satisfactory method of sealing presents itself, and the checking of these is undertaken mainly to create confidence between buyer and seller in an individual transaction and to accustom them to the use of a testing station.

The spring-balance is easily tampered with and, even when registering correctly, can be readily manipulated in actual use. Attempts, here as at Shwebandaw, are therefore being made to discourage its use. In the carrying out of this policy a platform weighing machine at the Markets Section stall has been placed at the disposal of buyers and sellers and it is in the use of this that the recorded sale of 18,848 baskets under shelter of the Markets Section stall has been made.

The foregoing record from the experiment areas over the few weeks during which we have been able to operate in them gives some idea of the work which is being attempted and of the scope for this which exists.

Adopting a very conservative estimate it would appear from the records which the experimental areas have furnished that loss to the

seller by the use of non-standard weights and measures (apart from any question of manipulation of these in actual use) must quite normally lie between 2 and 5 per cent.

The threshing-floor value of the crops of the country has been estimated (*vide* page 30 of the *Report of the Department of Agriculture, Burma, for 1936-37*) at Rs. 50 crores. A simple calculation will indicate the extent of the saving which the use of standard weights and measures, the most elementary move towards better marketing, is likely to effect. Developments of greater marketing consequence which may be expected to follow the general use of these have been indicated.

F. D. ODELL,
Provincial Marketing Officer,
Burma, Rangoon.

Annual Administration Report of the Southern Circle, Rangoon, for the year ended the 31st March 1939.

1. Administration.

U Ba Maung, Burma Agricultural Service, Class II held charge of the Circle from the 1st April 1938 till 13th November 1938, when, on return from leave, I assumed charge and carried out the duties of the post till the end of the year.

U Ba Maung spend 122 days on tour and I spent 53 days—a total of 175 days.

U Saw Shwe, B.Ag., Burma Agricultural Service, Class II, continued as Assistant Director of Agriculture throughout the year and attended a course of training in Statistics at University College, Rangoon, from the 16th June to the 5th October 1938. He toured for 119 days.

The district staff consisted of six Senior Agricultural Assistants only, the two charges of Prome North and Twante being held as additional charges by the Senior Agricultural Assistants, Paungde and Syriam respectively.

Distribution of district staff was as follows :—

Charge. (1)	Head-quarters. (2)	Held by. (3)	Period. (4)	Number of days spent on tour. (5)
I. Pegu Subdivision	Pegu ...	U Shwe Tha Htwe	Thoughout the year.	179
II. Insein East ...	Hlegu ...	U Ba Thein (1) ...	Do.	181
III. Insein West ...	Insein ...	U Seik ...	Do.	181
IV. Hanthawaddy East	Syriam	U Ba Lwin ...	Do.	159
V. Hanthawaddy West	Syriam	Do. ...	Do.	...
VI. Tharrawaddy, Letpadan, Minhla, Monyo Townships of Tharrawaddy District.	Letpadan.	U Tun ...	Do.	176
VII. The Zigon and Nattalin Townships of Tharrawaddy District and Prome South	Paungde	U Tun Aung Gyaw	Do.	160
VIII. Prome North	Prome	Do. ...	Do.	...

The four fieldmen allotted to the Circle were attached to the Pegu, Hanthawaddy, Letpadan and Paungde Charges. The fieldman attached to the Hanthawaddy Charge was on leave for a period of one month and 16 days during the year.

The headquarters office staff consisted of a head clerk, second clerk and third clerk. On the transfer of the third clerk to the office of the Rice Research Officer on the 21st March 1939, an apprentice clerk was promoted to the vacancy.

2. CHARACTER OF THE SEASON.

The monsoon was a favourable one as no pronounced breaks occurred and only very slight flooding took place in parts of Hanthawaddy, Insein and Tharrawaddy Districts.

While paddy outturns in Insein West were slightly under normal they were at least normal in Hanthawaddy District, some 7 per cent above normal in Pegu District and 25 to 35 per cent above normal in Tharrawaddy North and in Prome District.

It is difficult to account for the poorer outturns in Insein West as the rains were favourable, but in certain parts of that district, and also in Hanthawaddy, crops were rather thin, due possibly to the use of damaged seed as a result of the heavy rains experienced in December 1937.

As the season was a very good one for paddy in Prome North other crops, such as sesamum and groundnuts, did not do too well.

3. AGRICULTURAL EDUCATION.

Of the 18 applicants who applied for admission to the Hmawbi Farm School two were selected and successfully completed the nine months' course.

4. AGRICULTURAL RESEARCH.

As Hmawbi experimental farm, originally the Central Farm for the Circle, is under the control of the Rice Research Officer all research work conducted thereon is reported by him.

There were, however, 33 randomised yield tests carried out on major and minor seed farms and on cultivators' holdings. These consisted of 21 tests with pure line cultures and 12 tests with hybrid cultures.

Their distribution over the Circle was extensive and included such places as Shwedaung, Kanzu, Padaung and Paungde in Prome District, Zigôn, Kaingbyingyi, Magyikwin and Gwechaung in Tharrawaddy District, Thebyegon, Kalein, Pathi, Pauktaw, Taukkyan Hlegu, Shandegyi, Thanatpyin and Dabein in Insein District, Pegu, Waw, Kamase and Metkabin in Pegu District and Kayan and Nabegan in Hanthawaddy District.

Each pure line trial consisted of either 5 very early strains 6 early *Emalas*, 6 *kauklat Emalas*, 3 *Letywezins*, 6 *kauklat Ngaseins*, 5 *kaukkyi Ngaseins* or 6 *Midons*. In these two Chinese, 1 Siamese and 1 Javanese and 6 Patnai strains were included.

In addition to the standard strains under multiplication and distribution, it has been decided, as a result of these trials, to multiply A.36-3 (*Hnanwa Pingauk*), Gocoong and 2 Patnai cultures at Hmawbi, and to demonstrate C.33-8 in the eastern parts of Pegu and Hanthawaddy Districts and in the Padaung Township of the Prome District.

Hybrid cultures consisted of 8 progenies of a cross between *Ngaseins* C.19-27 and C.15-10, two progenies of a cross between *Aikukku*

(Japanese) and *Midon* D.17-88, two progenies of a cross between *Fortuna* (American) and *Emata* A.16-34 and one progeny of a cross between *Emata* A.16-34 and *Honduras* (American).

Rusults indicated that yields from these are in most cases as good as those of the respective local parent or parents while the quality is in all cases superior. As many of them are still heterozygous, however, further trials will be continued.

5. PESTS AND DISEASES.

Though isolated attacks by rice *hispa*, stem-borers, caseworms and ear-cutting caterpillars occured in parts of Pegu, Insein, Hanthawaddy and Tharrawaddy Districts the year was one in which no severe attacks were noticed or reported.

The occurence of the paddy seedling disease known as " We-kite-te " in the Sittang Colony areas was sporadic, but not severe. Work on this disease by the Agricultural Chemist would appear to indicate that affected plants suffer from oxygen starvation and further investigations will be carried out in an attempt to prove this and, if possible. to discover economic remedial measures.

6. DEMONSTRATION AND PROPAGANDA.

(a) *Shows and Exhibitions.*—One Agricultural Show was being arranged at Minhla. but was cancelled at the wish of the town elders on account of the unsettled conditions pertaining in the locality.

A comprehensive agricultural exhibit was as usual staged at the Arts, Crafts and Industrial Exhibition at Rangoon, and smaller exhibits at various pagoda festivals in different parts of the Circle as shown below :—

No. Place.	Exhibition, Festival, etc.	Date		Attendance.
		From	To	
1. Rangoon ...	Health ...	14-12-38	20-12-38	Fairly good.
2. Rangoon ...	Arts, Crafts and Industrial Exhibition	27-2-39	13-3-39	Good
3. Pegu ...	Pagoda Festival.	12-4-38	14-4-38	4,000
4. Onhne ...	Do.	2-3-39	4-3-39	2,500
5. Kyungon-Hlegu ...	Do.	3-3-39	4-3-39	600
6. Thakutpin (Kungyangone North)	Do.	11-4-38	15-4-38	4,000
7. Padaung ...	Do.	31-12-38	3-1-39	1,000
8. Htonbo ...	Do.	30-1-39	4-2-39	1,200
9. Shwedaung ...	Do.	1-3-39	4-3-39	8,000

Such exhibits, particularly those in the districts, are of very considerable value in so far as interested persons are given opportunities to see the different seeds available for sale at Central and seed farms, and to discuss their requirements with district members of the staff.

Apart from the receipt of orders, for seeds, ploughshares, etc., large numbers of departmental leaflets are distributed and all available information is given on the many agricultural problems which face the cultivator.

(b) *Paddy varietal demonstrations.*—During the year 131 (145) demonstrations with pure strains were carried out on cultivators holdings and the results are summarised below.

Percentages of increase over local varieties.

Charge		A 31-12	A.16-34	A 28-6	A.28-8	A.29-20	B.24-92	C 24-71	Xa-97	D.17-88
Prome	...	8·45	7·37	...	...	...	...	...	...	...
Paungde	...	...	...	14·46	9·98	19·64	...	...	...	...
Letpadan	...	...	...	9·21	10·11	13·06	9·59	...	...	...
Insein		...	...	...	17·27	...	17·65	17·03	...	...
Hlegu	...	...	...	...	...	...		12·40	23·00	4·00
Pegu	...	...	...	...	...	...	15·34	18·38	25·79	6·25
Syriam	...	...	...	...	...	...	...	6·10	9·27	4·31
Average	..	8·45	7·37	12·36	11·78	16·65	13·91	13·20	18·95	4·45

(c) *Fertilizer demonstrations.*—Ninety-nine (113) demonstrations were conducted on cultivators fields with Nicifos No. 2 and comprised 28 on paddy nurseries and 71 on broadcast sown and transplanted fields.

Applications of manure were at the rate of 100 lbs. per acre and the local cost of the manure and the local value of paddy were taken in all cases in arriving at the average profits due to treatment. For nursery treatments the average net profit was found to amount to Rs. 13-8 per acre. This figure was arrived at by taking into account the saving in seed, the increase in the number of " pyolets " and the increase in the yield of grain from the final crop grown on the manured nursery compared with similar considerations for the control nursery. Such a calculation omits values for the quicker growth of seedlings or for the stronger seedlings from manured nurseries.

For field treatments local prices for manure and paddy indicated an average profit in favour of the use of manure of Rs. 5-10-0 per acre.

(d) *Other crops.*—One hundred and thirteen (130) demonstrations were carried out with crops other than paddy such as Matpe, Onions and English Vegetables.

(e) *Sugarcane.*—As a result of the demonstration of improved sugarcanes in the Prome District, commenced some years ago, about 17 acres are now under P.O.Js, 2727, 2878 and 247 and Purple and Striped Mauritius near Letpadaw village in Prome Township and 2 acres at Minywa village in Shwedaung Township.

(f) *Mushroom culture.*—Thirty-seven demontrations were carried out during the year, but results were indifferent.

(g) *Implement demontration.*—Forty-eight (44) demonstrations were given with the Theikpan plough, 3 with the bullock hoe and two with the gyoke.

7. Implements.

There appears to have been a falling off again in the sale of plough ıares as only 433 were disposed of as against 642 in the previous year ough sales of plough bodies increased from 44 to 92.

8. Publications.

No original papers were published during the year, but 8,620 epartmental Leaflets were distributed.

9. Seed and Implement Advance Account.

Withdrawals from the Treasury for the purchase of seeds, implements ıd manures amounted to Rs. 13,556-8-6 and repayments amounted to 's. 14,435-12-9. Stock on hand and Outstandings on 1st April 1938 mounted to Rs. 12,895-13-6 and on 1st March 1939 to Rs. 13,258 4-9.

There were no bad debts and outstandings amounted to only s. 14-11-10.

10. Seed Distribution and Seed Farms, etc.

(a) *Seed Distribution.*—The total quantity of seed paddy distributed om the Hmawbi Central Farm, Major Seed Farms and Grazing Ground eed Farms was 70,745 (48,557) baskets and the stock on hand at the nd of the year was 39,605 (49.090) baskets. Distribution would have een greater, but for the fact that on many of the farms stocks were eld for the use of Deputy Commissioners and were not released by ıem until too late in the season for utilization for seed purposes. uch stocks which would normally have been disposed of for seed otalled 36,267 baskets. In addition to the seed distributed from epartmental farms 69,653 (104,803) baskets were distributed by private rowers giving a total seed distribution for the year of 140,398 (153390) askets a decrease of 12,992 baskets on the previous year.

The very considerable decrease of 35,150 baskets in distribution by rivate growers can, I think, be attributed almost entirely to rain amage in December 1937.

It is probable therefore that the loss in distribution on account of ıe heavy December rains amounted to 71,417 baskets comprising the 6,267 baskets held over at seed farms and the 35,150 baskets decrease ı distribution by private seed farmers.

The following table shows distribution from all sources.

Charge. (1)	*Ematas* in baskets. (2)	*Letywezins* in baskets (3)	*Ngaseins* in baskets. (4)	*Midons* in baskets. (5)	Total in baskets. (6)
'rome	1,542	...	...	...	1,542
'aungdè	33,404	...	...	...	33,404
etpadan	45,961	1,350	...	...	47,311
nsein	1,568	2,204	4,061	708	8,541
lègu	24	357	*2,050	102	2,533
yriam	2,042	...	16,7[illegible]6	11,117	29,895
'egu	46	1,358	15,765	3	17,172
Total ...	84,587	5,269	38,612	11,930	1,40,398

(b) *Area under improved paddies.*—The area known to be under improved paddies for the year was 397,034 (366,090) acres an increase of 30,944 acres.

Statement showing area under improved paddies, district by district.

District (1)	Acres in 1938-39. (2)	Acres in 1937-38. (3)	Percentage area under pure seed. 1938-39. (4)
Prome	22,254	21,383	6·0
Tharrawaddy ...	111,620	104,503	19·6
Insein ...	31,112	47,345	5·7
Pegu South ...	118,698	88,540	21·0
Hanthawaddy ...	113,350	104,319	13·9
Total ...	397,034	366,090	...

(c) *Pure paddies available for sale.*—The disposable surplus of pure paddies available for sale was estimated to amount to 3,205,366 (3,478,075) baskets, a decrease of 272,709 baskets and an amount proportionate to the decrease in seed distribution on account of rain damage. Particulars of supplies were intimated to all Chambers of Commerce and Rice Firms.

A summary of the statement is given below :—

Improved seeds available for sale.

Charge. (1)	*Ematas* in baskets. (2)	*Letywezins* in baskets (3)	*Ngaseins* in baskets. (4)	*Midons* in baskets. (5)	Total in baskets. (6)
Prome	184,880	...	...	...	184,880
Paungde	987,500	...	...	...	987,500
Letpadan	1,536,790	...	...	...	1,536,790
Insein	23,600	56,950	45,570	16,650	142,770
Hlegu	141	8,150	54,940	6,985	70,216
Syriam	90	...	43,590	13,210	56,890
Pegu	2,000	22,140	2,02,180	...	2 26,320
Total ...	2,735,001	87,240	346,280	36,845	3,205,366

(d) *Seed Farms.*—Three Major and 47 Minor Seed Farms were in operation during the year.

Of the 47 Minor farms, four are still under reclamation. Only one suffered wholly from flooding while two suffered partial damage. Generally, the working of the farms was satisfactory and very little remission of rent was necessary.

Assessed cash rents amounted to Rs. 16,397-11-3, (Rs. 12,973-15-0) and collections till the end of the year totalled Rs. 15,593-4-6, leaving a balance of Rs. 804-6-9 outstanding.

The assessed cash rents show an increase of Rs. 3,423-12-3 over the previous year in which a considerable amount had to be remitted on account of rain damage in December 1937. The actual amount of seed distributed per acre of all seed farms was 21·6 (13·2) baskets over a total area of 3,075·59 acres, or 22·7 (14·3) baskets on a total cultivated area of 2,973·26 acres, while distribution amounted to 72·9 (55·4) baskets per 100 baskets available for distribution in the period under report.

As the report year is 1st April to 31st March the figures dealt with under distribution show not only part of the seed taken over from the previous year but also the part actually distributed from the crop of the year under report. A strict comparision between production and distribution in any particular year is therefore difficult and the distribution percentage of the seed produced in any particular crop-year may vary considerably according to whether or not distribution has commenced early in the year, even though the distribution from each of several successive crops may actually be almost stationary or steadily progressive.

The seed distributed from Hmawbi and the Major Seed Farms at Pegu and Paungde, where storage facilities exist, was purchased from funds under the Seed and Implement Advance Account.

Sales were partly for cash and partly for credit though credit sales were confined as far as possible to seed farm tenants and to private seed farmers. Following the customary practice seed from minor seed farms was disposed of by the tenants under the supervision of the District Assistants.

When prices and demand are good tenants can sell a fair proportion of their stocks early in the season for cash and so pay rent and outstandings for seed supplies. When, however, prices are low and money is scarce they have to dispose of most of their seed stocks on credit or by exchanges for cultivators mixed paddies.

Inspections at harvest indicated that, with few exceptions, tenants had produced seed of at least 99 per cent purity. A high standard of purity has now been insisted upon for a number of years and apart from a general all round improvement in quality, increasing percentages of the crop, in localities where seed farms are situated, are finding their way to mills and buying stations in an almost pure state. Selective buying by some of the larger firms, who maintain chains of buying stations, is doing much to encourage the paddy cultivator to avail himself of improved marketing facilities and better prices.

(e) *Premiums for pure paddies.*—Premiums for pure paddies are not general throughout the Circle and no payment of these in the Insein East Charge and Hanthawaddy District has been recorded, though the purer and better quality samples there, as in other areas, command a readier sale than mixed samples and also escape any cut in price which may apply to the poor mixed consignments. Where, however, supplies of any particular strain are in demand, or where the competition among buyers is keen, small premiums of from Rs. 2 to Rs. 5 per 100 baskets are readily given.

Noteworthy examples for the year have been :—

(a) Of the 9,87,000 baskets of *Ematas* A.28-6 and A.28-8 available for sale in the Paungde Charge, approximately 7,00,000 baskets commanded premiæ varying from Rs. 3 to Rs. 5 per 100 baskets.

(*b*) In the Prome Charge Rs. 2 to Rs. 5 per 100 baskets over current markets rates were paid for 100,000 baskets of *Ematas* A. 28-6, A. 28-8 and A. 29-20.

(*c*) Though *Ematas* were quoted at Rs. 2 per 100 baskets lower than *Letywezins* in December in parts of the Letpadan Charge they were bought at the same price in January and commanded a Rs. 3 premium at one time in February,

(*d*) At least 10,000 baskets of Xa. 97 secured a premium of Rs. 5 per 100 baskets in the Insein Charge.

(*e*) In the Sitting Colonies a premium of Rs. 5 was paid for 15,000 baskets of pure grain and premiæ of Rs. 3 to 5 per 100 baskets were obtained in parts of Pegu Charge.

(*f*) Main Strains of Paddy under distribution. *Ematas*. Of these, A. 31-12 is the shortest lived and is an early "*wunza*" paddy grown to a small extent in Prome North and in parts of Insein District. A. 16-34. An early *Emata* strain of the Patnai type which is still in fair demand in Prome District. A. 28-8 and A. 28-6. Both are of the bold " Pindogale " type and are grown extensively in the South of Prome District and the North of Tharrawaddy District. When released some years ago their good yield attracted cultivators in Insein and Hanthawaddy districts, but it has been found that they cannot compete with good *Ngaseins* and *Letywezins* in these localities as regards basket weight and that brokers are inclined to pay much lower prices for them there than at Paungde. Their cultivation is therefore now mainly confined to Prome South and Tharrawaddy North. A. 26-20, is a longer lived *Pindosein* type which is becoming very popular in parts of Prome and Tharrawaddy districts and to a lesser extent in Insein North. On lowlying areas it gives heavy yields and is reputed to possess some resistance to drought. Normally, it does not command such a high price as the A. 28s on account of a greater tendency to abdominal white.

Letywezins :—B. 24-92 is now the only medium lived *Letywezin* strain under distribution. It is popular in the southern parts of the Tharrawaddy District and in the Insein and Pegu Districts. The extent of its cultivation depends on its ability to compete with "Yathale" varieties in the Tharrawaddy District and " Ekale " varieties in the Insein and Pegu Districts. *Ngaseins* C. 24-71 is a medium lived strain and is very popular in the eastern parts of the Insein, Pegu and Hanthawaddy Districts. It has replaced *Ngasein* C. 19-26 and competes successfully with " Ekale " varieties.

Xa. 97 is a hybrid culture of a cross between *Ngasein* C. 15-10 and *Ngasein* C. 19-26 which is becoming popular in the Insein, Pegu and Hanthawaddy Districts where it may eventually replace most of the poorer quality *Ngaseins*.

C. 14-8. A longer lived strain which is still in some demand for lowlying areas of the Insein and Pegu Districts. It yields well in years of good rainfall and commands a premium on account of its milling qualities.

Midon—D. 17-88 is the only *midon* strain under distribution. Its popularity depends largely on its shorter life compared with local *midons*. In Pegu District it competes with the popular local longlived *midon*, "shwewa", in yield and eating quality.

11—MISCELLANEOUS.

Work done with Co-operative Societies.—Although individual members of Co-operative Societies purchased seed or implements no direct dealings took place between Societies and the Department.

Work with Government Estates Department.—In the North Sittang Colonies the Government Estates Department purchased 872 baskets of Xa. 97, 15 baskets of *Ngasein* C. 24-71 and 9 baskets of *Ngasein* C. 14-8 for distribution. From this some 42,690 baskets were harvested and samples representing 22,970 baskets were tested for purity and seed value for the information of the Estate Manager.

As a full time temporary demonstrator is now employed future distribution work will be undertaken by the Agricultural Department and direct payments for seeds arranged between the two Departments. A full scheme of demonstration work will also be carried out.

In the South Sitting Colonies 1,426 baskets of Xa. 97 and *midon* D. 17-88 were distributed for seed and the entertainment of a full time temporary demonstrator in this area also should do much to ensure the future progress of demonstration work and the distribution of seed.

Double Cropping.—*Matpe* and gram were tried at 15 and 9 centres respectively in the Pegu Charge after *kaukyin* paddy. Gram failed completely in every case, but *Matpe* yields although low, indicated that under suitable conditions fair outturns might be obtained.

Heavy rain immediately after sowing no doubt reduced yields very considerably.

Further trials are being arranged.

Grazing Ground Seed Farms under proposal.—With the exception of an additional area of 25 acres at Intine, Hlegu Township, Insein District, no new areas have been handed over during the year for seed farm purposes, but the following have been applied for—

1. Part of the Mingalun Block of the Thakutpin East Reserve of Plains Reserves of the Insein Forest Division extending to 631·74 acres.

2. One hundred and twenty acres of Kyaton Grazing Ground in Kayan Township, Hanthawaddy District.

3. One hundred acres of Shanzugale Grazing Ground in Twante Subdivision, Hanthawaddy District.

4. An additional 200 acres of the Metkabin Grazing Ground in Kawa Township, Pegu District.

5. One hundred acres of the Kathitwaing Ywama Grazing Ground in Thanatpin Township, Pegu District.

Fertilizer Sales.—Though the use of artificial manures such as

Ammonium Sulphate and the Ammonium-Phosphate compounds is still very limited the following table indicates that a very definite increase in the amounts, purchased through District Assistants, may be recorded.

Charge.	1937-38 lbs.	1938-39 lbs.
Prome	7,440	480
Paungde... ...	3,072	5,120
Letpadan ...	780	1,920
Insein	1,600	10,624
Hlegu	1,072	4,560
Pegu	2,640	4,048
Syriam	400	800
Total ...	17,004	27,552

Tractors.—The employment of tractors for paddy cultivation seems to have entirely ceased. This no doubt is due to the fact that they cannot be profitably utilized under prevailing conditions in the Pegu Division.

R. WATSON,
Deputy Director of Agriculture, Southern Circle, Rangoon.

Annual Administration Report of the Irrawaddy Circle for the year ended the 31st March 1939.

ADMINISTRATION.

1. (*a*) Mr. R. A. Beale was in charge of the Circle till the 28th February, 1939, when he proceeded on four months' leave. I was on special duty at Bassein from the 19th to 28th February, 1939, when I relieved Mr. Beale. I held charge during the remaining part of the year.

The appointment of the Assistant Director of Agriculture was held by me till the 11th May, 1938, when on being transferred as Provincial Marketing Officer, Burma, Rangoon, the post was held by Mr. J. Tun Myat, Burma Agricultural Service (Class II), on probation, till the end of the year. Mr. John Tun Myat was on special duty at Bassein from the 25th April to 11th May, 1938, and on completion of this duty he was promoted to Burma Agricultural Service Class II on 12th May, 1938, to relieve me.

The following Senior Agricultural Assistants were in charge of the district work :—

1. Saw Tha Aye Gyi in Bassein District throughout the year.

2. U Chit Tin in Myaungmya North Charge in Myaungmya District throughout the year.

3. U Hla Phaw in Myaungmya South Charge in Myaungmya District throughout the year.

4. U Kya Yan in Henzada District up to the 26th May, 1938, when on being relieved by U Hla Sein, he was transferred to the West Central Circle. U Hla Sein held charge from the day he relieved U Kya Yan of his duties till the 31st October, 1938, when he was in turn relieved by U Thein Maung, who returned from leave U Thein Maung held charge from the 1st November, 1938, till the end of the year.

5. U Thein Maung in Maubin District till the 22nd June, 1938, when he proceeded on four months' leave. He was relieved by U Po Htoo, who was transferred from the West Central Circle, and the charge was held by the latter till the end of the year.

6. U Sein in Pyapôn District throughout the year.

7. U Pe Kyi (2) in Pyapon until the 6th June, 1938, when he was transferred to Myaungmya as Farm Superintendent in place of U Shwe Yin, who proceeded to the Rangoon University to undergo a special course of study in Statistics. On return from leave of U Thein Tun, he was transferred back to Pyapôn where he assumed duties on the 10th March, 1939.

8. U Hla Sein was attached to Bassein Charge till the 10th May, 1938, when he was transferred to Henzada. He held charge of Henzada District from the 26th May, 1938, till the 31st October, 1938, when he was relieved by U Thein Maung on return from leave. He was posted back to Bassein District on the 1st November, 1938, with headquarters at Bassein. On the 5th December, 1938, his headquarters was transferred to Yegyi, in the Kyônpyaw Subdivision of Bassein District.

The appointment of Farm Superintendent, Myaungmya, was held by U Shwe Yin until the 6th June, 1938, when he proceeded to the Rangoon University for statistical study. His post was filled by U Pe

Kyi (2) until the 10th March, 1939, when he was in turn relieved by U Thein Tun on returned from leave. U Thein Tun continued to hold the appointment till the end of the year.

U Thein Tun was attached to the Central Farm, Myaungmya as Senior Agricultural Assistant (Botany) in charge of plant breeding and horticulture up till the 19th October, 1938, when on being relieved by U Shwe Yin, he proceeded on leave. U Shwe Yin held charge till the end of the year.

Three fieldmen were attached to the Central Farm and two to each of the Major Seed Farms at Bassein, Henzada, Maubin and Pyapon.

Three clerks were attached to the Circle office and one to the Central Farm, Myaungmya.

Mr. R A. Beale was on tour for 143 days and I 15 days during the year. The Assistant Director of Agriculture for 139 days. The Senior Agricultural Assistants were on tour for a total number of 1,143 (1,141) days.

(b) *Farms.*—The Central Experimental Farm of the Circle is situated at Myaungmya. Four major seed farms at Bassein, Henzada, Maubin and Pyapôn and 63 minor seed farms in the five districts comprising the Circle were in operation during the year. The major seed farms at Bassein and Pyapôn are still without seed godowns and other necessary buildings. The absence of facilities for storing seed paddy at these centres renders inefficient the functioning of the farms.

The major and minor seed farms were used for multiplication of pnre seed for distribution to the cultivators for field trials of new strains and for critical yield tests of the strains under distribution. Improved ploughs and plonghshares were stocked at the central and major farms and also with the tenants in the case of minor farms.

CHARACTER OF THE SEASON.

2. The monsoon was on the whole favourable, except in few places where seedlings snffered damage in the nurseries and newly transplanted areas as the results of excessive water. This occured chiefly in the low lying areas of Myaungmya, Maubin and Pyapôn Districts Low lying lands bordering tidal streams also suffered from inundation by abnormally high spring tides in the middle of December and some damage to the crops resulted.

AGRICULTURAL EDUCATION.

3. No farm school has yet been opened at Myaungmya. Cultivators desiring to undergo a course of training in improved methods of agriculture had to be sent to Hmawbi. Only three men from Irrawaddy Circle were admitted owing to lack of accommodation for more. These students completed the course successfully.

The demand for such training as is given at the farm school appears to be growing, judging from the applications received each year. The opening of a farm school at Myaungmya would be a valuable asset to the Circle.

With a small fund made available by the Director of Agriculture, Burma; two courses of Farmers' Class were held successfully during the month of November 1938 at the Central Farm, Myaungmya. Landowners, owner-cultivators, new *Akyosaungs* and interested persons from Myaungmya, Bassein, Henzada and Maubin Districts were invited. For want of funds the invitation was unfortunately not extended to the

ltivators of Pyapôn District. The visitors had to be accomodated in e farm godown in the absence of a farm school, which would offer etter accommodation.

AGRICULTURAL RESEARCH.

4. The Central Farm at Myaungmya is the research station of the ircle and it is there that plant selection for crop improvement and anurial and cultural experiments are undertaken. Some of the xperiments are, however, duplicated at seed farms and other suitable entres in the Circle.

Twenty-two new varieties collected in the districts were put under election. Ninety-two cultures were isolated, of which fifty-five romising strains were retained for observation and further study. They omprise three *Ematas*, twenty-four *Letywezins*, twenty-three *Ngaseins*, wo *Medones*, and three *Byats*.

One hundred and eighty-seven strains were maintained in the rogeny rows. They were sixteen *Ematas*, thirty-seven *Letywezins*, ixty-nine *Ngaseins*, thirty-seven *Medones*, one *Byat* and twenty-seven ybrids.

Fifty-eight strains from the progeny rows were tested for yield at Myaungmya and another lot of twenty-one strains were also tested in various parts of the Circle.

Sixteen strains under distribution in the Circle were put under observation in Increase Plots for seeding the farm in the next season.

Thirteen strains which had passed through certain tests were grown on a small field scale for observation and to provide supply of seeds for further trials.

Seventeen strains were under multiplication on the main area of the farm for seeding the major and minor seed farms in 1939.

Nine manurial and one cultural experiments were conducted at the Central Farm, Myaungmya. The results in brief are given below :—

(1) The experiment to find out the most profitable cultural practice between broadcasting and transplanting paddy with or without manure was repeated. There was no significant difference between the two cultural practices without manure. With manuring either with bonemeal or *Nicifos* both practices yielded profits but broadcasting was a more paying proposition than transplanting. Broadcast sowing with a dressing of 80 lb. *Nicifos* gave the highest profit.

(2) (*a*) The experiment to study the effect on soil of repeated application of *Nicifos* No. 2 at 100 lb. per acre was continued. The results did not indicate that the repeated application had any injurious effect on the soil.

(*b*) The residual effect of *Nicifos* No. 2 applied yearly at 100 lb. per acre from 1930—1935, and then discontinued in 1936, 1937 and 1938 did not show any significant result.

(3) The experiment to find out the most economical dose of Ammonium phosphate either applied annually or at an interval of two or more years was repeated. Fifty lbs., 100 lbs. and 150 lbs. plots recieved fresh dressing this year according to plan. The experiment is not yet complete. The results so far indicated that an application of 150 lbs. every third year was the most economical dose.

(4) The residual effect of the experiment to find out the relative value of the organic and inorganic manures conducted last year was

studied. The doses were 20 lbs. and 40 lbs. N and 13·58 and 27·16 lbs. P_2O_5, the application having been so arranged that both single and double doses of Nitrogen and Phosphoric acid were given with each kind of manure. Significant increases were observed in most cases, but the residual effect was most pronounced in cases of a combined treatment with organic and inorganic manures, and of a treatment with two kinds of mineral fertilizer, Superphosphate and Ammonium Sulphate. There was very little difference in the residual effect between individual treatments with varying dosages.

(5) (*a*) The experiment to study the effect of manuring on the yield and quality of the subsequent crop raised from seeds obtained from plots treated in the previous year with organic and inorganic manures was conducted. The yields were not statistically significant but in regard to the quality of grain produced from seeds obtained from treated plots, slight increases in size and weight were observed.

(*b*) This is the experiment for the study of the cumulative effect of manuring on the quality of the grain. The seeds used were obtained from plots treated in the previous year with organic and inorganic manures and sown in plots treated with the varying doses of the same manures. The experiment was statistically significant. The results showed that the quality of the grain in regard to size, weight and hulling percentage had improved. In point of yield, the combined treatment with mineral and organic manures in full dose gave the best results. All treated plots gave significantly a better yield than the control.

(6) Residual effeet of *Nicifos* No. 1, *Nicifos* No. 2 and *Bonemeal* applied in 1937 was studied. The results was significant and the residual effect was most pronounced in case of a treatment with three kinds of manures combined. All the treatments had shown residual effect over the control.

(7) Residual effect of "Star" brand fertiliser applied in 1937 was studied. The results were statistically insignificant and no conclusion could be drawn.

(8) Residual effect of the experiment designed to find out the response of Myaungmya soil to the treatment with Phosphate manure was studied. The experiment was repeated at Hmawbi and Mandalay. There were no significant differences between the treatments, but the the residual effects were still noticed and significant in case of treatments with Bonemeal and Superphosphate combined with Nitrogen.

(9) The experiment to find out the relative efficiency of Sodium Nitrate and Ammonium sulphate in the presence and absence of Superphosphate was conducted. The results show that there was no advantage for nitrate over ammonia either with or without phosphate nor yet when used together.

(10) A cultural experiment to study the effect of different dates and methods of harvesting on the yield and quality of the crop was carried out. The results were statistically insignificant and no conclusion could be drawn.

PESTS AND DISEASES.

5. Serious damage to the paddy crop by Ufra or Eelworm disease occured in the low lying areas of Pyapôn District, in Myaungmya and Moulmeingyun Townships of Myaungmya district, and the Bassein Subdivision of Bassein District. In Maubin District this disease

occurred to a small extent in the low-lying areas where drainage was defective, but was not very serious. The advice of the Mycologist was asked for regarding the measures to be adopted in the coming season, and the experiments with chemicals for the control of the disease planned by him will be carried out in certain badly affected areas of Pyapôn, Myaungmya and Bassein Districts.

Ear-cutting caterpillers (*Cirphis unipuncta*) did some damage to the crop at the time of harvest in certain areas of the Myaungmya and Maubin Districts, where late transplanting had to be carried out.

Stem-borers and Rice *Hispa* occurred in Maubin, Myaungmya and Bassein Districts, but the attacks were not serious.

A kind of paddy bug identified by the Entomologist, Burma, as "Scotinophara coarctata" did serious damage to the crop in Alan Village tract in Maubin District. Despite attempts to control the pest by means of light traps, hand nets and manuring of the plants with fertilizers, the effected areas resulted in almost a total failure of the crop. The advice of the Entomologist was sought to combat the pest. The Assistant Entomologist visited the affected areas and measures such as sweeping the bugs after flooding the field and picking them up at the corner of the field to be destroyed in water and kerosene, were suggested by the Entomologist, later.

DEMONSTRATION AND PROPAGANDA.

6. A total of 1,688 demonstrations, including 576 varietal, 210 manurial, 788 Theikpan ploughs, 96 storage of Farm Yard Manure and 18 others, were carried out in the district during the year.

The following table shows the number of demonstrations carried out in each assistant's charge :—

Charges.	Varietal.		Manurial.		Storage of F.Y.M.	Implements.		Remarks.
	Paddy.	Other crops.	*Paddy.*	Other crops.		*Ploughs.*	Intercultivators.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Bassein ...	134	16	13	...	22	96	...	
Myaungmya North.	54	...	3	...	20	33	...	
Myaungmya South.	80	...	20	...	22	10	...	
Henzada ...	151	...	55	...	32	500	2	
Maubin ...	42	...	93	...	...	84	...	
Pyapôn ...	115	...	26	...	...	65	...	
Total 1938-39	576	16	210	...	96	788	2	
Total 1937-38	327	...	105	...	...	450	...	

One Agricultural Show was organized at Henzada with the help of local bodies, officials and private persons. This was to have taken place in March of last year, but had to be postponed to the first week of April in order that it might not coincide with the Shows held at Bassein and Maubin. It was well attended and aroused considerable interest among the people of the district.

During the year under report, though the local bodies of Maubin, Bassein and Henzada Districts had enough funds at their disposal for District Shows, they had to keep these in abeyance due to the unsettled conditions in the districts following the communal riots.

Exhibits of the Agricultural Department's improved strains of paddy, Theikpan ploughs and fertilizers were put on show at 13 pagoda festivals, *phongyi-byans* and other gatherings. The local members of the staff attended these and held informal discussions with the interested persons, answered inquiries, gave advice and booked orders for seed and implements for the next season. These shows serve a very useful purpose in the enlightening of the cultivators regarding the work done by the Agricultural Department and in enabling the district staff to make contact with the farmers whom they would not otherwise be able to meet.

IMPLEMENTS.

7. The popularity of the Theikpan No. 00 ploughshares is increasing. During the year 3,159 (1,733) of these ploughshares and 1,196 (480) wooden frames, to which the share were fitted and 7 No. 0 shares were sold by the staff of the Agricultural Department to cultivators. In addition to these numbers, 620 No. 00 shares were sold by a local manufacturer at Sangin, Maubin District, 215 shares and 72 frames by a Pyu manufacturer during the Bassein Sgaw Karen Our Day gathering. U Ba Maw of the Peacock Foundary, Henzada, had now started manufacturing No. 00 shares at the instance of this department to meet the demands of the staff of the district.

Two Hindustan ploughs were also sold.

The following statement shows the number of implements sold in each assistant's charge :—

Charges. (1)	Plough shares. (2)	Plough frames. (3)	Hindustan plough. (4)	Bullock hoe. (5)
Central Farm, Myaungmya	675	385	...	...
Bassein	629	267	2	...
Myaungmya North ...	622	48	...	...
Myaungmya South ...	488	106	...	...
Henzada	401	214	...	...
Maubin	201	80	..	...
Pyapôn	150	96	...	...
Total 1938-39 ...	3,166	1,196	2	...
Total 1937-38 ...	1,733	480	...	1

PUBLICATIONS.

8. No original papers were published during the year.

Advantage was however taken of the shows arranged by the district staff to distribute leaflets on crops, pests and diseases to the cultivators.

SEED AND IMPLEMENT ADVANCE AND LOANS TO CULTIVATORS BY THE DEPUTY COMMISSIONER, ETC.

9. The total withdrawals from the Treasury for purchase of seeds, implements and manures amounted to Rs. 28,136-4-9 (Rs. 28,835-15-0) and the refunds to Rs. 22,761-5-9 (Rs. 30,747-6-6).

The stock in hand on the 1st April, 1938, was valued at Rs. 11,548-5-3 and the outstandings on that date amounted to Rs. 227-8-6. The corresponding figures on the 31st March, 1939, were Rs. 18,734-13-6 and Rs. 158-11-3 respectively. A nett profit of Rs 1,762-15-0 was made on the year's working.

No loans were applied for by the cultivators from the Deputy Commissioners through this Department.

As a general rule cash payment was made by purchasers for seeds, implements and manures taken from the Department. Where it was found necessary to allow credit to approved buyers, the transactions were direct dealings between the cultivators and the Department without recourse to loans from the Deputy Commissioners.

MISCELLANEOUS.

10. (a) *Seed Distribution.*—The total quantity of seed paddy distributed by the Department within the Irrawaddy Circle with the help of seedsmen at the various seed farms for sowing in 1938 was 35,793 baskets as compared with 42,521 baskets in the previous year. This represents a decrease of 15·9 per cent. This was due to shortage of seeds on account of damage to crops done by the December rains.

The principal strains distributed were *Ngasein* and *Emata*. *Emata* was left to find its own level in places where there was yet a keen demand for it as it had a limited market. The area under it had therefore contracted. The other minor strains distributed were *Yathalay*, *Ngayunwa*, *Taungleikpan* and *Kyaukkyi Medon*. In addition to the seed paddy distributed by the departmental agency, the natural spread of pure improved seed from one cultivator to another, as far as could be traced amounted to 40,964 (28,056) baskets.

The table below shows the quantities of improved seed issued by departmental agency and natural spread in each charge—the corresponding figures for the preceding year being supplied for comparison.

Charges.	Quantity of seed distributed in baskets.					
	1938.			1937.		
	By Depart-ment.	Natural Spread.	Total.	By Depart-ment.	Natural Spread.	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bassein	11,294	3,748	15,042	12,323	2,396	14,719
Myaungmya North ...	6,154	4,575	10,729	7,138	2,800	9,938
Myaungmya South ...	5,556	1,536	7,092	5,415	1,750	7,165
Henzada	3,703	12,220	15,923	7,128	9,320	16,448
Maubin	2,226	12,735	14,961	6,111	8,360	14,471
Pyapôn	6,860	6,150	13,010	4,406	3,430	7,836
Total ...	35,793	40,964	76,757	42,521	28,056	70,577

Since the last harvest seed amounting to 14,006 baskets have been issued from seed farms up to the 31st March, 1939, for sowing in the coming season. This figure has not been included either in the above statements or in Appendix III which contains the quantity issued for sowing in 1938 alone.

(b) *Area under pure paddy.*—The estimated area under pure paddy issued by the Agricultural Department is shown below :—

Charges.	Area in acres.	
	1938-39.	1937-38.
(1)	(2)	(3)
Bassein	19,915	22,900
Myaungmya North ...	13,896	14,900
Myaungmya South ...	11,550	9,800
Henzada	16,340	16,600
Maubin	14,701	19,0 0
Pyapôn	10,598	11,800
Total ...	87,000	95,000

The decrease in area might be attributed to (1) want of seeds, (2) reduction in area under *Emata*, the latter being the prime factor.

(c) *Sale of Fertilizers.*—Sales of bonemeal by two firms dealing in this manure amounted to 939½ (1,036½) tons during the year. This fertilizer was used chiefly in Bassein and Myaungmya Districts. 51·1 (151) tons of the above quantity were sold to cultivators from the Central Farm, Myaungmya.

Imperial Chemical Industries (India) Ltd., sold 12·10 tons Sulphate of Ammonia and 26·40 tons *Nicifos* No. 2 to cultivators. Of this quantity, 6·5 tons *Nicifos* No. 2 were sold departmentally in Bassein, Maubin and Henzada Districts.

The decrease in the sale of bonemeal might be attributed to wide spread financial distress in season 1938 on account of shortage of crop due to 1937 December rains.

(d) *Paddy Strains under distribution—Emata.*—Two strains of the *Emata* type are grown and distributed in the Circle. A28-6 and A16-34 are being limited to Henzada District. A16-34 is splitting and may have to be given up in no distant time.

A28-6 is grown in practically all parts of the remaining districts. It is acknowledged on all hands to be a good yielder, if not the best, and is now well known and popular in most part of the Circle. Though it is understood that a good market has been established in Europe for this *Emata* grain, it is not now considered necessary to increase its popularity among the cultivators, but rather to leave it to expand or shrink with the demand.

Yodaya.—In Henzada District, *Emata* has not found favour with the local millers for either par-boiling or white rice milling. They prefer *Yodaya* which has been grown in the district for decades and which has been instrumental in making Henzada Long Grain a recognized quality, popular in certain markets.

To meet the demand of this *Yodaya* type, therefore, with the small quantity of seeds available for multiplication, three strains, namely A35-13, A35-6 and A35-19 were grown on a field scale for the first time on some farms in Henzada, during the year under report. Of these the popular vote was for A35-13 as being the most suitable strain for the type of soils met with in Henzada District. A35-19 though a good yielder is declared rather long lived and A35-6 as not as good as A35-13. These two strains will be grown on a small scale, as it is not considered wise to drop them altogether too soon.

Ngasein.—Several strains of *Ngasein* are now under distribution. These are adapted to a wide range of conditions, and some of them are already established favourites.

C32-1 (*Beloogyun*) is an early maturing strain, and on account of its attractive grains and milling outturn is replacing the local *Kaukyin* paddy.

C34-1 (*Shwepu*) is also an early maturing strain and though only introduced from Hmawbi last year, has attracted the attention of the cultivators in all the districts, especially Henzada and part of northern Bassein, where local *Yodayas* are grown. There is every likelihood of its replacing C32-1.

C24-102 (*Ngasein Theedat*) has a medium life period. It yields well and possesses a hard, translucent grain which is reputed to mill very well. As it commands a ready market, it is gradually replacing A28-6 which though as good a yielder, if not better, has no ready market.

C31-13 (*Ngakyauk*) is in great demand in those tracts where paddy of fairly late maturing character is needed. It is an excellent yielder with good milling grain for which millers generally pay a premium. Though put under distribution only a few years ago, its cultivation is expanding every year.

C30-32 (*Bilat Ngasein*) the longest lived of the *Ngaseins*, possesses large and attractive grains, which mill well. It grows well in low situations and can withstand flooding to a depth of from three to four feet. It is much liked by cultivators in those parts where conditions are suited to it, especially, Wakèma Township, Myaungmya District. It gives the best results in almost all the late *Ngasein* yield tests at the various centres in the circle this year.

C24-71 (*Shannyein*) has been introduced in the saline tracts along the seaboard of Pyapôn District where the inferior paddy known as *Kale* is grown. It is a good yielder and the demand for it is growing.

C28-15 (*Sitpwa*), a deep water paddy, yields well and possesses hard, translucent, uniform white grains as opposed to the soft, chalky red grains of the local types. It is suitable for the very low land, particularly in Maubin District, where water collects to a depth of about twelve feet. The demand for seeds at present far exceeds the supply.

Hybrids.—The two *Ngasein* Hybrids Xa97 and Xa108 were introduced into the Circle in 1936. Of the two Xa97 is more popular and in greater demand, as on the whole it produces a better crop. The large attractive grains of these two strains have no equal in Burma.

Others.—In the northern parts of Bassein and Myaungmya Districts, where the land is high, requiring early maturing varieties, B25-18 (*Yathalay*) and *Ngavuuwa* are under distribution and in great demand. These grains are in special demand for the Bombay Markets.

D25-4 (*Ngakywe*) is popular and in great demand, being a good yielder.

New selected *Ngasein* strains are being tried out in the district and the retention of any strain depends upon its suitability to any particular tract or tracts.

(e) *Progress.*—With the staff working in the districts, where communications on the whole are difficult and protracted, the progress so far attained is very encouraging. Bigger programme of demonstration and propaganda is anticipated with the increase of staff in Bassein and Pyapôn Districts by the division of each into two Senior Agricultural Assistant's charges.

The encouragement and assistance given by certain members of the public as well as by the Government Officials in other departments are gratefully acknowledged.

(f) *Double Cropping.*—The cultivation of *Matpe* on paddy land after the paddy crop has been reaped continued to be practised in Maubin District, where the area under this crop is increasing. The estimated area for the year is 7,000 acres. A few trials were carried out at Henzada with a view to encourage the cultivators working the lands close to and within the embankments to take on this double cropping.

(g) *Karachi Gram.*—Two hundred and sixty (324) baskets of Karachi gram were distributed in Henzada. The estimated area under this crop is 4,000 acres in Maubin District, 5,470 acres in Henzada District and 350 acres in Bassein District.

(h) *Groundnuts.*—Sixty (32) baskets groundnut seeds were distributed. The estimated area under Spanish groundnut is 510 acres in Henzada District and 35 acres in Bassein District. Thirty acres were under Japanese groundnuts.

(i) *Work done with Co-operative Societies.*—The activities of the Agricultural Department was not helped to any material extent by the Co-operative organizations. Dealings, if at all, were conducted with the individual members and not with the societies as units.

(j) *Rent of seed Farms.*—The gross income obtained in the way of rent of seed farms amounted to Rs. 25,152 (Rs. 19,532-4-6). The sum of Rs. 173-6-0 (Rs. 3,083-4-3) remained uncollected on the 31st March, 1939. Rent to the extent of 2,639 (3,149) baskets valued at Rs. 2,380 (Rs. 2,834) was remitted on ten farms on account of damage to crops by want of rains in the case of Henzada District and by floods, high spring tides and serious eelworm diseases in the case of other districts.

(k) *Production of seed paddy.*—A total of 118,590 (105,485) baskets of seed paddy was produced at the farms in the Circle. After necessary quantities had been disposed off for rent and cultivation expenses 59,983 (60,132) baskets were stocked for distribution as seed.

The quantity of seed issued within the Circle during 1938 for sowing in that season alone (excluding amounts issued from 1939 crop for next season) represented 33·9 (35·66) per cent of the gross crop obtained from seed farms in the previous year. This was equivalent to a distribution of 8·8 (11·4) baskets of the seed for every acre under crop at the seed farms.

(l) *Expenditure and Receipts.*—Expenditure including salaries and all other charges debited to the public funds amounted to Rs. 81,154 (Rs. 76,243) and receipts to Rs. 30,667-8-3 (Rs. 22,449-12-9). Receipts were thus equivalent to 37·7 (29·4) per cent of gross expenditure.

MAUNG MAUNG,
Deputy Director of Agriculture,
Irrawaddy Circle, Bassein

BASSEIN :
Dated 14th May 1939.

Annual Administration Report of the Tenasserim Circle, for the year ended the 31st March 1939.

ADMINISTRATION.

(*a*) Mr. W. Gregson, N.D.A., I.A.S., Deputy Director of Agriculture, held charge of the Circle up to the 17th May, when he went on long leave on Medical Certificate. U Tun Yee, B.A.S. II, Assistant Director of Agriculture, held charge of the Circle up to the end of the year. Mr. Gregson was on tour for 9 days and U Tun Yee was on tour for 164 days.

U Khin, B.Sc. (Reading), B.A.S. II, was Assistant Director of Agriculture, throughout the year. He was on tour for 153 days.

(*b*) There were eight Senior Agricultural Assistants and one Junior Agricultural Assistant. The statement is given below according to their respective charges :—

Charge. (1)	Head-quarters. (2)	Held by (3)	Period. (4)	Number of days on tour (5)	Remarks. (6)
1. Central Farm, Mudon.	Mudon	Mr. T. Tin Kyaing.	1-4-38 to 13-7-38 and from 14-11-38 to 31-3-39.	19	S.A.A., F.S., *on leave for* 4 months from 14-7-38 to 13-11-38.
		U Ba Yin ...	14-7-38 to 13-11-38.		Offg. F.S., Mudon, in addition to his own duty as S.A.A. Boty., Mudon.
2. Central Farm, Mudon.	Mudon	U Ba Yin ...	Throughout the year.	46	S.A.A. Botany.
3. Central Farm, Mudon.	Mudon	U San Pe ...	Throughout the year.	15	S.A.A. Horticulture.
4. Moulmein	Moulmein	U Thant ...	Throughout the year	208	S.A.A. Dist. Work.
5. Mudon ...	Mudon	U Thet Tun	Throughout the year.	180	J.A.A. Dist. Work.
6. Thatôn ...	Thatôn	U Tun Tin	Throughout the year.	194	S.A.A. Dist. Work.
7. Paung ...	Paung	U Pe Kyi ...	Throughout the year.	204	S.A.A. Dist. Work.
8. Pa-an ...	Pa-an ...	Mr. L. Yone Shein.	Throughout the year.	182	S.A.A. Dist. Work.
9. Tavoy ...	Tavoy ...	Mr. L. War Hone.	Throughout the year.	193	S.A.A. Dist. Work.

(c) There were 5 fieldmen, 3 attached to the Central Farm, Mudon, in Farm, Plant Breeding and Horticultural Section and the remaining 2 attached to the Major Seed Farm, Thatôn.

CHARACTER OF THE SEASON.

Light showers as usual started falling in April, but actual monsoon began early in May throughout the Circle. The distribution was exceptionally good throughout the season until in early October when very heavy and continuous rain amounting to between 7 to 9 inches fell. The total rainfall during the year was less than average from 15 to 20 inches in different districts.

The early rainfall facilitated timely working of the paddy land and though the total rainfall was below average the good distribution was very beneficial to all the crops throughout the Circle. But the heavy and continuous rain in early October caused unfilled grains. The destructive floods accustomed in Salween, Gyaing and Ataran River Valleys were entirely absent during the year. The rainfall table is given below charge by charge :-

Rainfall during the year charge by charge.

Charge.	No. of rainy days.	Total rainfall in inches.	Average of previous years.
(1)	(2)	(3)	(4)
Moulmein ...	156	175·07	156 (10 years).
Mudon	175	173·20	187·31 (9 years).
Thatôn	147	212·79	231·35 (4 years).
Paung	147	212·79	231·35 (4 years).
Pa-an	163	168·35	175·81 (10 years).
Tavoy	170	190·77	220·22 (10 years).

AGRICULTURAL EDUCATION.

(a) *Training of Staff and Adult Cultivators.*—None of the Staff was sent out for any training during the year. One adult cultivator was sent to Hmawbi Farm for nine months' course and returned with good result. Thirty-eight adult cultivators received training at Central

Farm, Mudon, for various periods. The statement is given below for ready reference :—

Training of Adult Cultivators.

Type of cultivators.	Place of training.	Kind for which training was given.	Period of training.
(1)	(2)	(3)	(4)
Twenty-five adult cultivators from Moulmein, Mudon, Thatôn, Paung, Pa-an and Tavoy charges.	Mudon Agricultural Station.	Horticulture and General Agriculture.	One month from 1-6-38 to 30-6-38 with 3 students and from 5-9-38 to 6-10-38 with 22 students.
Seven adult cultivators from Thatôn, Paung, Pa-an and Mudon charges.	Mudon Agricultural Station.	Horticulture and General Agriculture.	One month from 6-10-38 to 5-11-38.
One cultivator from Tavoy deputed by the Deputy Commissioner, Tavoy.	Mudon Agricultural Station.	Horticulture and General Agriculture.	One year, expired on 6-7-38.
Five Shan Students from Tawnpeng, Northern Shan States.	Mudon Agricultural Station.	Canning and Bottling of fruits and vegetables.	Two months from 1-6-38 to 31-7-38.

(b) *Lectures on Agricultural Subjects.*—The Deputy Director and the District Staff gave lectures on Agricultural Subjects at suitable localities especially on improved seeds and implements, improved methods of cultivation, etc. The total number of lectures given was 113 and the attendance was 4,450. The statement is given below :—

Lectures delivered by the District Staff.

Charge.	No. of lectures.	Attendance.	With or without Lantern-slides.	Remarks.
(1)	(2)	(3)	(4)	(5)
Moulmein ...	34	1,600	Without ...	32 by S.A.A. in charge, two by D.D.A., T.C.
Mudon	2	900	Without ...	By J.A.A. in charge.
Thatôn	13	900	With ...	By S.A.A. in charge.
Paung	...	...	...	...
Pa-an	11	400	Without ...	By S.A.A. in charge.
Tavoy	53	650	Without ...	By S.A.A. in charge.
Total ...	113	4,450		

(c) *Exhibition, Show and Competition.*—Five Exhibitions of improved seeds, implements, manures, samples of preserved fruits, common insects and important diseases were made at various important Pagoda Festivals in the Circle. An Agricultural Produce and Cattle Show accompanied by Exhibition was held at the Shwezayan Pagoda Festival, Thatôn, with the help of the Pagoda Trustees from the 25th February to 4th March 1939. It was presumed to be the largest Show and Exhibition held departmentally. The list is given below :—

Charge. (1)	Place. (2)	Date. (3)	Kind. (4)	Attendance. (5)
1. Moulmein ...	Moulmein ...	6th to 23rd Feb. 1939.	Exhibition at the All-Burma Exhibition.	10,000
2. Mudon ...	Shwenattaung	1st to 3rd Feb. 1939.	Exhibition only	5,000
3. Mudon ...	Lamaing ...	1st to 5th Mar. 1939.	Exhibition only	5,000
4. Thatôn ...	Koktheiknayon, Bilin.	4th to 7th Feb. 1939.	Exhibition only	5,000
5. Thatôn ...	Thatôn Shwezayan.	25th Feb. to 4th March 1939.	Exhibition with Agricultural Produce and Cattle Show.	15,000

(d) *Agricultural Leaflets.*—Agricultural Leaflets on important subjects were freely distributed to the cultivators amounting to 11,760.

AGRICULTURAL RESEARCH.

(*a*) *Mudon Agricultural Station.*—Paddy yield tests, manurial experiments, etc., carried out at the Station are fully described in the Station Report.

(*b*) In the districts, 37 yield test experiments on paddy of various types and ages were carried out and the results of the successful ones which pass Z test are given below in a consolidated form for reference :—

Result of the Yield Test Experiments of A Types.

Locality. (1)	Local Paddy. (2)	A29-23. (3)	A29-16. (4)	A28-6. (5)	A32-6. (6)	A33-18. (7)	A35-17. (8)	Standard error. (9)	Critical Difference. (10)
***Kamake* (*Moulmein*).**									
Acre yield ...	1,709	1,782	1,958	1,965	1 753	...	2,097	...	...
Per cent control ...	100	104·3	114·6	115	102·5	...	122·7	3·46	10·21

Result of the Yield Test Experiments of A Types—concld.

Locality. (1)	Local Paddy. (2)	A29-23. (3)	A29-16. (4)	A28-6. (5)	A32-6. (6)	A33-18. (7)	A35-17. (8)	Standard error. (9)	Critical Difference. (10)
Kanni (Moulmein).									
Acre yield ...	1,279	1,402	1,600	...	1,336	1,427	1,600	...	...
Per cent control ...	100	109·7	125·1	...	104·5	111·6	125·1	4·75	14·0
Ye (Mudon).									
Acre yield ...	1,955	2,323	1,955	...	2,777	2,182	1,813	...	...
Per cent control ...	100	118·8	100	...	142	111·6	92·7	8·16	24·07
Hlaingbwe (Pa-an).									
Acre yield ...	1,089	1,193	1,230	...	1,170	1,119	1,170	...	...
Per cent control ...	100	109·2	112·9	...	107·4	102·7	107·4	1·82	5·37

Among the A Type paddies, our standard strain A29-23 gave an average yield of 3·32 baskets per acre over the local paddy.

Result of the Yield Test Experiments of C Types.

Locality. (1)	Local Paddy. (2)	C 28-16 (3)	C 27-21. (4)	C 34-14. (5)	C 24-71. (6)	Xa97. (7)	Xa108. (8)	Standard error. (9)	Critical difference. (10)
Ngamaung (Pa-an).									
Acre yield ...	2,658	2,876	2,948	2,731	...	2,562	2,634	...	...
Per cent control ...	100	108·2	110·9	102·7	...	96·3	99·1	2·36	6·96
Major Seed Farm (Thatôn).									
Acre yield ...	1,956	2,319	...	1,754	2,138	2,238	2,218	...	...
Per cent control ...	100	118·5	...	89·7	109·3	114·4	113·4	5·32	15·69
Le-ein (Paung).									
Acre yield ...	2,107	2,213	...	2,160	1,760	1,893	1,760	...	...
Per cent control ...	100	105	...	102·5	83·5	90	83.5	4·66	13·74
Nyaungbinseik (Moulmein).									
Acre yield ...	1,335	1,569	1,305	1,848	..	1,980	1,863	...	...
Per cent control ...	100	117·6	97·8	138·4	...	148·3	130·5	8·41	24·8

Among the C Type paddies which are the most widely cultivated in the Circle our standard C28-16 gave an average outturn of 4·6 baskets per acre over the local paddy.

Result of the Yield Test Experiments of E Types.

Locality. (1)	Local Paddy. (2)	E30-42. (3)	E27-57. (4)	E34-22. (5)	E31-23. (6)	E35-9. (7)	E35-10. (8)	Standard error. (9)	Critical difference. (10)
Kwanyeik (Moulmein)									
Acre yield ...	1,795	2,090	2,109	...	2,204	1,710	1,691	...	...
Per cent control ...	100	116·4	117·4	...	122·7	95·2	94·2	7·44	21·94
Thayagon (Mudon).									
Acre yield ...	1,360	1,588	1,436	...	1,284	1,814	1,966	...	...
Per cent control ...	100	116·6	105·5	...	94·4	133·3	144·4	10·61	31·3
Hlainbin (Thatôn).									
Acre yield ...	2,390	2,924	...	2,864	2,904	2,581	2,501	...	...
Per cent control ...	100	122·3	...	119·3	121·5	108	104·6	3·54	10·44
Bisagat (Thatôn).									
Acre yield ...	2,501	3,001	...	2,884	2,702	2,581	2,561	...	...
Per cent control ...	100	119·3	...	115·3	108	103·2	102·4	2·3	6·78
Kyaikkalo (Paung).									
Acre yield ...	1,840	1.600	...	1,733	1,787	1,707	2,027	...	...
Per cent control ...	100	87	...	94·2	97·1	92·7	110·1	3·9	11·5

Our standard strain E30-42 gave an average yield of 4·8 baskets per acre over the local paddy.

(c) *Sugarcane.*—One varietal yield test with P.O.J. 2878, P.O.J. 2727, Co. 419, Co. 413, Co. 421, Co. 219 and local as control was conducted on a cultivator's land at Myaing Village near Shwegoon in Pa-an charge. The result will be obtained during ensuing year. Another varietal yield test with P.O.J. 2878, Co. 419 and local as control was conducted on a cultivator's land at Bilin in Thatôn charge. The result will be obtained during the ensuing year. A spacing experiment using P.O.J. 2878 cane with 2½, 3, 3½ and 4 feet was conducted on a cultivator's land at Taguzeik, near Shwegoon in Pa-an charge. The result will be obtained during the coming year.

PESTS AND DISEASES.

(a) ***On Paddy***—Ngamyaungdaung, Army worm, Case worm and Rice hispa were all present in patches in various districts in the Circle. But the attack was not serious enough as to draw special attention.

Helminthosporium or Brown spot disease on paddy appeared rather seriously at the Central Farm, Mudon, and in Chaungzon Township. A Type paddy of medium age were most susceptible to the disease though other types were not entirely free. An experiment to study this disease conducted by the Mycologist, at the Central Farm, Mudon, gave no definite result.

Akhat-phet disease as usual appeared in Launglon and Thayetchaung Townships in Tavoy District, causing considerable damage. The disease is spreading very quickly and is called for immediate attention. The Mycologist, attributed the cause of this disease to a kind of Eel worm. Application of Sulphur, Nitrogen, Phosphorous and complete fertilizer including Farmyard manure does not prevent the disease from attacking, but the treated plants respond to Nitrogen, Phosphorus, and Complete Fertilizer and gave a better yield than the control.

(*b*) *Upland Crops*.—No serious nature of pests and diseases was reported during the year. But as usual Mango borer, Sooty mould, Scale insect, Lemon butterfly caterpillars and Wilt on betel vine were pretty common in every district. The combined attack of Scale insects and Sooty mould on sugarcane in Pa-an and Thatôn charges caused considerable reduction in yield and quality of *Kyanthaga*.

DEMONSTRATION AND PROPAGANDA.

Six demonstration charges were organized with six temporary demonstrators and two fieldmen. In addition to distribution of seeds, manures and implements, 676 demonstrations and trials of seeds, of manures, of implements and of method of cultivations, affecting 414·29 acres were carried out during the year and the statement is given below charge by charge :—

Demonstration and Propaganda.

Charge. (1)	Demonstrators' Headquarters. (2)	No. of Temporary Demonstrators. (3)	Demonstrations and Trials.		Remarks. (6)
			No. of holdings (4)	Area in acres. (5)	
Moulmein ...	Moulmein ...	1	116	83·51	Throughout the year.
Mudon ...	Mudon ...	1	91	80·05	Throughout the year.
Thatôn ...	Thatôn ...	2	71	37·65	Two fieldmen, throughout the year.
Paung ...	Paung ...	1	116	84·00	Throughout the year.
Pa-an ...	Pa-an ...	2	172	86·12	One throughout the year, the other for six months.
Tavoy ...	Tavoy ...	1	110	42·96	Throughout the year.
Total ...	...	8	676	414·29	

(a) *Seeds.*—The standard improved strains of paddy of various types were demonstrated to the extent of 256 plots with an area of 240·61 acres and the list is given below charge by charge, according to type :—

Paddy Demonstrations.

Charge.	A Type.		B Type.		C Type.		E Type.		Total.		Remarks.
	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Moulmein	7	7·00	3	3·00	17	25·75	20	25·00	47	60·75	7 A Types failed owing to bad seeds.
Mudon ...	12	10·00	...	...	23	29·50	18	21·50	53	61·00	2 Cs and 1 E failed owing to pests.
Thatôn ...	...	...	...	...	20	10·00	10	5·00	30	15·00	1 E failed due to flood
Paung ...	10	10·00	...	...	20	20·00	15	15·00	45	45·00	All successful.
Pa-an ...	10	12·25	10	14·75	7	8·25	...	...	27	35·25	3 Cs failed owing to bad seeds.
Tavoy ...	8	·40	...	...	34	13·71	12	9·50	54	23·61	7 As, 13 Cs and 2 Es failed owing to bad seeds.
Total ...	47	39·65	13	17·75	121	107·21	75	76·00	256	240·61	

(b) *Trial cultivation of new and improved seeds.*—

(i) *Paddy.*—C 30-3, B 32-3 and B 32-4 were tried in Moulmein charge with success. C 30-3 giving an outturn of 36 baskets per acre on high land. C 34-14 was tried in Mudon charge giving an outturn of 33·9 baskets per acre. B 32-3, B 32-4, C 30-33 and A 35-19 were tried in Pa-an charge giving indications that the two Bs could not compete with our standard B 28-12.

(ii) *Other Seeds.*—Imperial Spanish Groundnut was tried for the first time on *kaing* land in Salween and Ataran Riverine area as a single crop. The yield in one place came up to 89·6 baskets per acre and when tried as a second crop after paddy the yield came up to 64 baskets per acre in one place. There is great future for this crop especially in *kaing* lands. The average outturn per acre is 47·2 baskets.

Malpe is unknown in this Circle and was tried for the first time at riverine area with success. It can be cultivated as a main crop as well as second crop after paddy. In both cases encouraging results were obtained.

Pedisein was also tried as a *kaing* crop in riverine area. It gave a very encouraging result as a second crop after paddy in Kawbein in Moulmein charge.

New Era Cowpea.—This is also unknown in this Circle and was tried in riverine area as a *kaing* crop both in Pa-an and in Tavoy charges. As a main crop on *kaing* land, it gave an extraordinary yield of 36 baskets per acre. As a second crop after paddy it was successful and gave encouraging result in Tavoy charge.

Coriander was also tried for seed purpose in Pa-an charge and gave a yield of 22 baskets per acre though sown late in the season.

Striped Mauritius and Gilman Red Sugarcanes were tried for chewing purpose at Magyigyun in Pa-an charge. The result will be known during the coming season. The list of trial cultivations is given below charge by charge :—

Trial Cultivation of New Seeds.

Charge.	Paddy.		Other crops.		Total.	
	Plots	Area.	Plots.	Area.	Plots.	Area.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Moulmein ..	3	1·40	17	3·40	20	4·80
Mudon ...	2	6·00	...	...	2	6·00
Thatôn ...	...	...	2	1·00	2	1·00
Paung ...	...	...	7	7·00	7	7·00
Pa-an ...	4	·88	35	8·77	39	9·65
Tavoy ...	...	...	7	4·05	7	4·05
Total ...	9	8·28	68	24·22	77	32·50

(c) *Manures.*—Artificial manures comprising Ammonium Sulphate, Nicifos Nos. 1 and 2 and Bonemeals were demonstrated at 101 plots covering 47·93 acres mainly on paddies and the list is given below charge by charge :—

Manurial Demonstrations.

Charge.	Paddy Nurseries.		Transplanted Paddy.		Sugarcane.		Other Crops.		Total.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.
(1).	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Moulmein ...	8	4·00	11	3·88	1	0·30	...	...	20	8·18
Mudon ...	8	4·00	8	4·00	...	...	...	...	16	8·00
Thatôn ...	...	...	17	8·50	...	...	...	...	17	8·50
Paung ...	...	...	20	10·00	...	...	...	...	20	10·00
Pa-an ...	...	...	15	6·75	...	...	1	0·50	16	7·25
Tavoy ...	...	...	12	6·00	...	...	...	...	12	6·00
Total ...	16	8·00	83	39·13	1	0·30	1	0·50	101	47·93

(d) *Implements.—Theikpan* and Cyprus ploughs, bullock cultivators of foreign and locally improved design, improved harrows and *Gyoks* were demonstrated in 200 plots covering 76·21 acres as stated in the table given below charge by charge. The *Theikpan* intercultivator with iron tynes designed locally were found to be quite successful for groundnuts. But the one designed imitating B.T.S.L. intercultivator was found to be very light and weak in tynes. By using bigger and stronger tynes and by putting weights on the implement it will be quite good for intercultivating Bean and Maize crops.

Implement Demonstrations.

Charge.	Ploughs.		Inter-cultivators		Harrows.		*Gyoks.*		Total.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Moulmein ...	10	1·38	...	...	...	...	...	...	10	1·38
Mudon ...	20	5·05		...	...	...	...	...	20	5·05
Thatôn ...	9	2·25	9	9·00	...	...	...	...	18	11·25
Paung ...	44	22·00	...	...	...	...	...	...	44	22·00
Pa-an ...	41	12·31	16	9·90	12	4·57	2	0·50	71	27·28
Tavoy ...	37	9·25	...	...	...	...	...	...	37	9·25
Total ...	161	52·24	25	18·90	12	4·57	2	0·50	200	76·21

(e) *Method of Cultivation.*—Line or square sowing of suitable crops such as groundnut, *maipe*, *pedisein*, etc., mixed cultivation of *Pegyi* and Maize and double cropping of groundnut, *maipe*, *pedisein* and *pelun* after paddy were demonstrated in 42 plots covering an area of 16·99 acres as stated below charge by charge :—

Method of Cultivation.

Charge.	Line and square sowing.		Mixed cultivation.		Double Cropping.		Total.	
	No.	Area.	No.	Area.	No.	Area	No.	Area.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Moulmein ...	15	6·80	...	...	4	1·60	19	8·40
Mudon ...	...	..	...	...	...	...	...	...
Thatôn ...	4	1·90	...	...	...	...	4	1·90
Paung ...	...	...	...	...	...	...	...	...
Pa-an ...	17	6·11	2	2·58	...	...	19	6·69
Tavoy ...	...	...	...	...	...	...	...	...
Total ...	36	14·81	2	2·58	4	1·60	42	16·99

IMPLEMENTS.

The most important implements were *Theikpan* plough shares, B.T.S.L. cultivators for intercultivation of sugarcane and "kaing" crops and Iron Crushers for extraction of cane juice in *Kyanthaga* making. The *Theikpan* ploughs were manufactured in the Circle and the well known *Theikpan* No. 00 shares for paddy land were used not only in this Circle but in other Circles as well especially in Irrawaddy and West Central Circle. B.T.S.L. cultivator is a useful implement for cane cultivation and the cost has gone down to Rs. 21 each. *Theikpan* Iron teeth intercultivator for groundnuts as well as for other "kaing" crop was designed and tried in Pa-an charge. Slight improvements are necessary and it will become popular implement as the cost is very low. The nnmber of various implements distributed during the year is given below in statament charge by charge :—

Implement Distribution.

Charge. (1)	Number of *Theikpan* plough shares. (2)	Value. (3)	Number of Sugar-cane Crushers. (4)	Value. (5)	Number of B.T.S.L. Cultivators. (6)	Value. (7)	Number of Spare-parts of Crushers. (8)	Value. (9)	Remarks. (10)
		Rs. A.		Rs. A.		Rs.		Rs. A. P.	
Moulmein	7	3 15	1	215 0	1	21	...	...	Excluding 1 Shan Lein Share.
Mudon ...	97	55 0	...	...	...	...	...	...	Excluding 102 Shan Lein Shares.
Thatôn ...	...	...	...	...	6	164	...	...	Excluding 105 Shan Lein Shares.
Paung ...	...	...	...	...	...	...	...	...	Excluding 200 Shan Lein Shares.
Pa-an ...	72	40 8	25	5,044 8	...	...	12	59 9 6	Excluding 51 Shan Lein Shares.
Tavoy ...	457	286 8	...	...	...	...	...	...	
Total ...	633	385 15	26	5,259 8	7	185	12	59 9 6	

In addition to the above the manufacturer of *Theikpan* Share distributed 610 Shares within the Circle and 3,262 Shares to other Circles.

SEEDS.

(a) *Seed Farms.*—The most important crop is paddy. The selections were made at Central Farm, Mudon. A.29-23, B.28-12, C.28-16 and E.30-42 are outstanding strains, good both in yield and quality of grain with higher percentage of hulling. The purity is maintained in the Government Central and Major Seed Farms, the produce from which is seeded at the Grazing Ground or Minor Seed Farms and the produce from these seed farms is distributed among the private seed farmers and cultivators in general. The seed farms in the Circle are given below in statement forms according to their classes giving the figures for distribution during the year with seeds reserved for distribution in the coming season :—

(i) *Central and Major Seed Farms.*

Name of Seed Farm.	Charge.	Area Worked.	Kind.	Produce of 1938-39 reserved for distribution.	Distributed in 1938-39.
(1)	(2)	(3)	(4)	(5)	(6)
		Acres.		Baskets.	Baskets.
Central Farm—Mudon	Mudon ...	42·14	Paddy ...	1,863	1,365
Major Seed Farm—Thatôn.	Thatôn ...	148·50	Paddy ...	4,134	2,839
	Total ...	190·64	...	5,997	4,204

(ii) *Minor or Grazing Ground Seed Farms.*

Charge.	No.	Area.	Produce of 1938-39 reserved for distribution.	Seed distributed in 1938-39.
(1)	(2)	(3)	(4)	(5)
Moulmein	9	464·00	4,620	776
Mudon	8	270·46	6,339	4,117
Thatôn	12	676·90	23,623	13,025
Paung	12	701·70	17,240	12,029
Pa-an	5	183·14	2,945	414
Tavoy	4	138·10	2,379	1,947
Total ...	50	2,434·30	57,196	32,308

(iii) *Private Seed Farms.*

Charge (1)	No. (2)	Area. (3)	Produce of 1938-39 reserved for distribution. (4)	Seed distributed in 1938 39 in baskets. (5)	Remarks. (6)
Moulmein ...	13	410·00	7,420	330	
Mudon ...	6	194·00	2,200	1,376	
Thatôn ...	5	115·00	2,650	1,955	
Paung ...	2	33·00	1,225	...	Newly Established.
Pa-an ...	6	34·26	515	...	Do.
Tavoy ...	12	67·00	655	822	
Total ...	44	853·26	14,665	4,483	

The total distributions of various strains of improved paddies from the above seed farms together with 24 baskets from other sources amount to 41,546 baskets (34,395) in the whole Circle, out of which 5,876 baskets passed through the Seed and Implement Advance account as stated below charge by charge :—

Charge.	Moulmein.	Mudon.	Thatôn.	Paung.	Pa-an.	Tavoy.	Total.
Number of baskets.	1,124	632	1,315	1,525	1,122	152	5,876

(b) *Distribution.*—The statement given below will show the total distribution of various improved seeds, fruit trees, sugarcane sets, etc., through the agencies of the Department during the year charge by charge (one basket of paddy = 50 lbs.) :—

Total Distributions of Improved Seeds (in baskets), Sugarcane, Fruit, Trees, etc.

Varieties. (1)	Moulmein. (2)	Mudon. (3)	Thatôn. (4)	Paung. (5)	Pa-an. (6)	Tavoy. (7)	Total. (8)
Paddies ...	2,159	6,122	17,304	11,492	1,542	2,929	41,546
Sugarcane ...	...	...	...	...	557,015	...	557,015
Oil palm seeds	...	6,025	...	...	...	...	6,025
Oil palm plants	...	957	2,000	...	...	...	2,957
Fruit trees ...	174	...	30	5	...	456	665
Pineapple suckers.	12	...	...	...	...	500	512

(i) The following seeds and fruit trees were supplied to other Circles :—

Paddies	...	3 baskets.
Fruit trees	...	1,231
Pineapple suckers	...	2,498

(ii) Artificial Fertilizers distributed in the Circle are given in the following table :—

Charge.	Moulmein.	Mudon.	Thatôn.	Paung.	Pa-an.	Tavoy.	Total.
Fertilizer distributed in the Circle in lbs.	17,860	29,600	6,256	2,240	864	6,720	85,174

In addition, the amount directly supplied by the firms are 115,568 lbs.

(c) *Area under Improved Seeds.*—The area under various improved seeds is given below in the following statement in acres charge by charge :—

Varieties. (1)	Moulmein. (2)	Mudon. (3)	Thatôn. (4)	Paung. (5)	Pa-an. (6)	Tavoy. (7)	Total. (8)
Paddies ...	5,159	30,822	81,304	24,692	23,062	8,177	173,216
Sugarcane ...	...	...	3,500	...	1,784	...	5,284
Oil Palm ...	12	60	...	...	...	500	572
Fruit trees ...	...	...	...	...	...	10	10
Kew pineapple	100	100	...	...	...	100	300
Total ...	5,271	30,982	84,804	24,692	24,846	8,787	179,382

PUBLICATIONS.

No bulletins or leaflets were compiled and printed for publication during the year.

SEED AND IMPLEMENT ADVANCE AND LOANS TO CULTIVATORS.

(a) At the beginning of the year the advance was Rs. 13,800 and the allotment was Rs. 13,000. As the funds were required for purchase of

pure seed paddy, and cane crushers for distribution during the year, both the advance and the allotment were raised to Rs. 15,000 and Rs. 17,000 respectively. The balance sheet of the account is given below :—

Seed and Implement Advance Balance Sheet for the year 1938-39.

No.	Particulars of Items.	Amount.	No.	Particulars of Items.	Amount.
		Rs. A. P.			Rs. A. P.
1	Value of Stock in hand on 1st April 1938.	2,086 1 0	5	Sale proceeds credited into treasury during the year 1938-39.	15,354 0 9
2	Bills outstanding on 1st April 1938.	2,016 9 6	6	Value of articles supplied to other offices or departments without cash payment but by book transfer.	1,262 5 0
3	Amount drawn from treasury during the year.	12,757 2 9			
4	Value of articles purchased from other offices or departments without cash payment but by book transfer.	3,135 12 3	7	Value sanctioned to be written off on account of losses incurred during the year.	*Nil.*
			8	Value of Stock on 31st March 1939 :—	
				Rs. A. P.	
				(1) Book value ... 2,188 13 6	
				(2) *Deduct* on account of depreciation on loss while in stock ... 134 1 0	
				Total ... 2,054 12 6	
				Net value ...	2,054 12 6
			9	Bills outstanding on 31st March 1939.	2,138 7 6
	Total ...	19,995 9 6		Total ...	20,809 9 9
	By Profit ...	955 6 3		By loss ...	141 6 0
	GRAND TOTAL ...	20,950 15 9		GRAND TOTAL ...	20,950 15 9

(*b*) The Circle did not utilize the Agriculturist loan under Deputy Commissioners for distribution of seeds and implements during the year.

MISCELLANEOUS.

Thanks are due to those who co-operate with the Department in developing agriculture in the Circle. Special mention must be made of Lieutenant-Colonel Pelly, Commissioner, Tenasserim Division, for his sympathetic view with the working of the Department in general. Thanks are also due to the good *Akyosaungs* numbering 88 in the Circle. U Ohn Maung, Dip.Ag., Higher Grade Pleader, President of the Municipality and Shwezayan Pagoda Trustee of Thatôn, deserves special mention for his benevolent help in staging successful Exhibition and Agricultural Produce and Cattle Show at Thatôn during *Taboung* Festival of Shwezayan Pagoda. The District and Farm Staff of the Circle are to be congratulated for the progressive work done during the year.

TUN YEE,
Deputy Director of Agriculture,
Tenasserim Circle.

MOULMEIN, *15th May 1939.*

General Administration Report on the Arakan Circle for the year ended the 31st March 1939.

1. ADMINISTRATION.

I remained in charge of the Circle throughout the year and spent 161 days on tour.

U Chin Khine, Assistant Director of Agriculture, was on medical leave up to the 14th April 1938, when he relieved U Tun Myat who was officiating in his place. He was transferred to Minbya as his headquarters in October 1938 and went on tours for 135 days.

Out of the seven Senior Agricultural Assistants sanctioned for the Circle, only five, including two for the Akyab Central Farm have been appointed to date.

On the Central Farm, Akyab, U Tha Tun Aung, Senior Agricultural Assistant, was in charge of the farm throughout the year. He also did some district work in parts of Akyab Township and was on tour for 62 days. He took charge of the West Akyab Charge from the middle of February 1939 to the end of the year when U Ba Sein (1) went on leave.

U Saw Hla Aung, Senior Agricultural Assistant was in charge of the plant breeding section during the year.

In the district, there are three Senior Agricultural Assistants—two in the Akyab District and one in the Kyaukpyu and Sandoway Districts.

U Shwe Tha, Senior Agricultural Assistant was in charge of the North Akyab charge throughout the year with his headquarters at Myohaung. He went on tours for 183 days.

U Tun Mra Oo, was in charge of West Akyab Section with his headquarters at Rathedaung up to the 27th September 1938, when he was transferred to the South Arakan Charge with headquarters at Kyaukpyu. He was out on tours for 181 days.

U Ba Sein (1), Senior Agricultural Assistant, held charge of the South Arakan Section up to September 1938, when he was transferred to the West Akyab Charge. He went on medical leave since the 11th February 1939.

Two fieldmen—one at the Minbya Farm and the other at Thegan-Gwason were appointed during the year.

2. CHARACTER OF THE SEASON.

The Agricultural Season during the year under report was good and the rainfall copious and even, except for the late rains of November 11th which did much damage to the *Kauklat* crop of the Akyab District and *Kaukkyi* crop of the East and South Arakan Tracts of the Circle. The monsoon started on the 14th May 1939, which is about the normal date. The total rainfall recorded for the year was 222·71 inches being 39·35 inches above the average for the past ten years.

The tillage operations were started in time but owing to the prevalence of foot-and-mouth disease amongst the working cattle of the district, they were completed a fortnight or three weeks later than usual. But owing to even and satisfactory distribution of rainfall, it was

unaffected and a bumper crop was expected of the year. But the storm with 2·09 inches of rain on the 11th November 1938, put all the standing crop flat in the field under water which adversely affected the maturation of seeds.

3. AGRICULTURAL EDUCATION.

No proper farm school was maintained during the year under report but practical training in the handling of *Theikpan* ploughs and Burmese harrows and also in gardening works were given to six lads for the following periods :—

(1) One student for 5 weeks.
(2) Four students for 12 weeks.
(3) One student for 28 weeks.

4. AGRICULTURAL RESEARCH.

Research work was confined mainly to the paddy crop on the Central Farm, Akyab. There were five varieties under the first year, and one hundred and five cultures in the second year for observation and selection. In the third year selection, there were six strains under maintenance of purity and also six strains in the fourth year for multiplication. Owing to inferiority in yield and quality one hundred and eighty-five cultures of the first year and seventeen cultures of the second year were discarded and the remaining strains are to be carried on for further tests and observations in the coming year.

Hybridisation Works.—Forty-eight cultures of F_7 generation between local C 23-2 (Zambwet) and C.29-37 (Blue Rose) were sown during the year. After comparative study in the laboratory of the various plant characters both within and between different cultures, some promising plants will be retained. A majority of these have become stable in their F_7 generation and few promising cultures will be put under preliminary yield test in 1939-40.

Yield and Varietal Tests.—Five yield test under Fisher's Latin Squares were carried out during the year. The strains C 31-849 ; C.31-5791 ; and D.32-4 again were the best yielders and gave a significant result.

Also a series of seven yield tests were carried out on major seed farms in the Circle, to duplicate the works on the Central Farm.

Manurial Experiments.—There were two manurial experiments, (1) Residual effect of Nitrogenous and Phosphatic manures. This experiment is in its fourth year to study the residual effect. The differences in yield due to manures is found again to be significant at the 5 per cent level of significance and therefore it has to be repeated next year.

(2) *Hyganic Manures.*—This experiment was carried out during the year with rates of 10, 20, 30 and 40 lbs of N_2 per acre on Latin Square layouts. But the results are not significant.

Manurial Experiments on Coconuts.—The coconut area of 10 acres is divided into ten blocks, where sub-blocks having more or less uniform trees were selected and the manurial and cultural treatments given. Though the trees are responding well to the treatments given, the one that receives 10 cart loads of farm yard manure per acre round the trees gave the best yield of nuts during the year.

Germination Tests of Paddy.—574 samples of cultivators' paddy which were damaged by December 1937 rains, were sent in by the Deputy Commissioners during April 1938 with a view to issuing seed loans. Germination tests on them were conducted. 64·1 per cent of sample gave 75 per cent and above in germination ; 33 per cent of the sample gave 50 per cent and above and only 2·9 per cent of the sample gave less than 50 per cent germination. The advice given by the Department was to use extra seed rate for the second lot of samples and to replace with new seeds for the third lot.

MAJOR SEED FARMS.

(a) *Mingan Seed Farm (area 78·91 acres).*—This farm is utilised for seed multiplication and the varieties grown there were C.23-6 Laroong and D.30-4 Ngacrinthee paddies. The area was rented out to three tenants at an average rent of 12·5 and 9·375 (50 lbs.) per acre for the first and second class soils. During the year a yield of 3021 baskets (50 lbs.) was obtained and the entire crop was taken over by the Department for distribution.

(b) *Minbya Seed Farm (area 105·67+1·83=107·5 acres).*—The area was rented out to five tenants at a rental of 12·5 baskets per acre. The varieties grown there were C.23-6 and D.30-4 paddies and a yield of 4,300 baskets (50 lbs.) was obtained and 3,235 baskets were taken over for distribution.

(c) *Thegan-Gwason Seed Farm (area 83·99+3·09=87·08 acres).*—The area was rented out to three tenants at a rental of 11·94 baskets per acre. The varieties grown were C.23-6 and D.30-4 paddies and a yield of 2,370 (50 lbs.) baskets was obtained and 2,030 baskets were taken over for distribution.

(d) *Kyaukpyu Seed Farm (area 22·55 acres +30·85=53·40 acres).*—39·74 acres were cultivated with pure seeds during the year. The area was leased out to five tenants at a rental of 11 baskets per acre. A total production of 1,324 baskets was obtained and 1,265 baskets were taken over for distribution.

MINOR SEED FARMS.

(1) *Gaungpyudaung G.G. Seed Farm (area 138·77 acres).*—It was leased out to two tenants at a rental of 9·37 baskets per acre and the varieties grown there were C.23-6 and D.30-4 paddies. A yield of 4,314 baskets was obtained and 2,693 baskets were taken over by the Department for distribution.

(2) *Nagabauk G.G. Seed Farm (area 109·56 acres).*—The area was leased out to two tenants at a rental of 9·3 baskets per acre. The varieties grown there were C.23-6 and D.30-4 paddies. Out of a total production of 5,600 baskets, 2,062 baskets were taken over by the Department and the rest are to be distributed by the tenants.

(3) *Wagin G.G. Seed Farm (area 75 acres).*—The area was leased out to two tenants at a rental of 9·3 baskets per acre. A yield of 3,552 baskets was obtained of which 2,369 baskets were taken over by the Department and the rest are to be distributed by the tenants.

(4) *Rokpyin Wasteland Seed Farm (area 58·26 acres).*—The area was leased out to a tenant at a rental of 5·5 baskets per acre in its 5th year of its workings. A yield of 2,320 baskets was obtained and 1,078 baskets were taken over by the Department for distribution.

(5) *Myebon G.G. Seed Farm (area 50 acres).*—The area was leased out to two tenants at a nominal rent of 3·2 baskets per acre. A yield of 1,620 baskets was obtained for distribution by the tenants.

(6) *Myaungbwe G.G. Seed Farm (area 22·5 acres).*—The area was leased out to two tenants at a rental of 5·5 baskets per acre. A yield of 884 baskets was obtained for distribution by the tenants.

(7) *Rathedaung G.G. Seed Farm (area 35 acres).*—The area was leased out to two tenants at a rent of 10 baskets per acre. A yield of 960 baskets of C.23-6 and D.30-4 paddies was obtained for distribution by the tenants.

(8) *Kyoonbyin G.G. Seed Farm (area 35 acres).*—The area was leased out to a tenant at a rent of 5·5 baskets per acre. A yield of 612 baskets of C.23-6 and D.30-4 paddies was obtained for distribution by the tenant.

(9) *Kaingri G.G. Seed Farm (area 35 acres).*—The area was leased out to a tenant at a rent of 5·5 baskets per acre. A yield of 650 baskets of C.23-6 was obtained of which 134·4 baskets were taken over by the Department for distribution and the remaining stock to be distributed by the tenant.

(10) *Sandoway Jail Seed Farm (area 23·04 acres).*—18 acres were under cultivation and the area was leased out to a tenant at a rental of 13·00 baskets per acre. A yield of 805 baskets was obtained from the area for distribution by the tenant.

(11) *Paukpin G.G. Seed Farm (area 92·13 acres).*—This was in the second year of its working. The area was leased out to three tenants rent-free for three years. A yield of 3,408 baskets was obtained for distribution by the tenants.

(12) *Ngathalauk G.G. Seed Farm (area 100 acres).*—This was leased out to four tenants rent-free for three years. It is in its second year. A yield of 2,940 baskets was obtained for distribution by the tenants.

(13) *Weggyidaung G.G. Seed Farm (area 100 acres).* This area was leased out to four tenants rent-free for three years. It is in its second year. A yield of 2,428 baskets was obtained for distribution by the tenants.

(14) *Kyauktan G.G. Seed Farm (area 50 acres).*—This area was leased out to two tenants rent-free for three years. It is in its second year. A yield of 260 baskets of C.23-6 was obtained for distribution by the tenants.

(15) *Mayinchaung G.G. Seed Farm (area 26·45 acres).*—This area was leased out to two tenants rent-free for three years. It is in its second year. A yield of 512 baskets of C.23-6 was obtained for distribution by the tenants.

(16) *Debruchaung G.G. Seed Farm (area 39·04 acres).*—This area was leased out to two tenants rent-free for five years. It is in its second year. (An area of about 15 acres was culturable and it was cropped with local *Taungya* paddy).

(17) *Leiktaung G.G. Seed Farm (area 50 acres).*—This area was leased out to two tenants rent-free for three years. It is in its second year. A yield of 160 baskets of C.23-6 was obtained for distribution by the tenants.

(18) *Somai G.G. Seed Farm (area 50 acres).*—This area was leased out to two tenants rent-free for three years. It is in its second year. A yield of 280 baskets of C.23-6 was obtained for distribution by the tenants.

(19) ***Kyaukkok G.G. Seed Farm (area 32 acres).***—It is in its second year of working. The area was leased out to four tenants rent-free for three years. A yield of 800 baskets was obtained for distribution by the tenants.

5. Crop Pests and Diseases.

No serious cases of insect attacks were observed during the year. A few cases of Rice Hispa (Armigera) and Rice stem borer (Schœnobius bipunctifer) appeared sporadically with no serious damage.

The rhinoceros beetle (Oryctes rhinoceros) pest on coconut palms occured in Akyab and Kyaukpyu District. Systematic extraction has been carried throughout the year under report and is apparently sufficiently effective to prevent serious damage to the trees. All possible breeding areas on the farm have been cleared and regular searching of grubs and pupæ made. Green muscardine fungus (Metarrhizium anisopliæ) was inoculated in the traps against egg-laying beetles and it is hoped that this parasitic fungus would kill large numbers of beetles and thus considerably reduce their number.

6. Demonstration and Propaganda.

(a) *Seed distribution.*—The following amount of paddy was distributed from departmental seed farms and the crop matured during the year :—

Central Farm, Akyab ...	... 947	baskets (50 lbs.).
Mingan Major Seed Farm ...	... 3,248	
Thegan-Gwason Seed Farm ...	... 2,576	
Minbya Seed Farm ...	... 3,232	
Kyaukpyu Seed Farm ...	... 829	
Gaungpyudaung G.G Seed Farm	... 3,540	
Nagabauk G.G. Seed Farm ...	... 4,922	
Wagin G.G. Seed Farm ...	... 3,183	
Myaungbwe G.G. Seed Farm ...	... 854	
Myebon G.G. Seed Farm ...	... 873	
Rathedaung G.G. Seet Farm ...	... 1,254	
Kyoonbyin G.G. Seed Farm ...	... 668	
Kaingri G.G. Seed Farm ...	... 640	
Rokpyin Wasteland Seed Farm ...	... 1,962	
Sandoway Jail Land Farm ...	... 150	
Total ...	28,878	or 1,443,850 lbs. or 644·575 tons.

During the previous year 636·518 tons were distributed from the departmental seed farms and there is thus an increase of only 8 tons of seeds during the year under report from the same seed farms. But it is expected that there would be a substantial increase in seed distribution as soon as the other nine grazing ground seed farms are in proper working order.

In addition to this, it is reported that 23,504 baskets of pure seeds were distributed from private seed farms making a total seed distribution of 52,382 baskets or 1169·24 tons.

Distribution has been carried out in all Akyab District Townships except Maungdaw ; the main areas being Kyauktaw, Myohoung, Rathedaung, Minbya and Akyab Townships.

The total area under pure paddy in the circle is estimated to be 42,947 acres :—

			acres.
North Akyab Charge	...	...	13,329
West Akyab Charge	...	...	12,358
East Akyab Charge	...	...	2,673
South Arakan Charge	...	...	11,445
Akyab Township	...	...	3,142
	Total	...	42,947

The area under pure paddy estimated in the previous year was 31,012 acres and there is thus an increase of 11,935 acres, which is mainly due to the distribution of seeds undertaken by private seed farm owners and other cultivators.

The following miscellaneous seeds were also distributed by the department during the year :—

			lbs.	oz.
Peas and beans	...	...	180	0
Tobacco seeds	...	...	1	0
Shallot bulbs	...	...	164	0
Mustard seeds	...	...	1,687	0
Vegetable and flower seeds	...	...	10	13
	Total	...	2,042	13

Private Seed Farms.—During the year 54 private seed farms covering an area of 957 acres were cropped with C. 23-6 and D. 30-4 paddies. A total yield of 38280 baskets was obtained and it is estimated that 23504 baskets of pure seeds were distributed for sowing purposes by them.

Demonstration of Improved Seeds.—There were altogether 223 plots under C. 23-6 and D. 30-4 paddies in the circle but 42 plots were damaged by heavy incessant rains of July.

Demonstration of Improved Implements.—The use of *Theikpan* ploughs with No. 00 shares and Burmese harrows were demonstrated and 190 of them were conducted during the year.

Detailed statements of demonstrations are appended under Appendix VI.

7. Implement Distribution.

The following implements were distributed during the year :—

Plough shares No. 00	...	...	...	357
Plough bodies (local made)	...	...	...	178
Burmese harrows	...	...	...	17
Planet Junior Hoe	...	...	...	1
		Total	...	553

Conference, Shows and Meetings.—Five village meetings in connection with economic propaganda work were held during the year and subjects of Agricultural improvement discussed.

Three township conferences at Kyauktaw, Myohoung and Maungdaw were held during the year in which the Department set up stalls and took a prominent part in their workings.

A farm show was held at the Central Farm, Akyab, in November 1938 during the visit of His Excellency the Governor of Burma.

Three cattle and produce shows were held at Akyab, Kyauktaw and Ramree during the year. At Akyab it was made in conjunction with the seventh Agricultural and Co-operative Conference. They were a great success.

Horticultural Works—Demonstrations of layout of gardens, planting garden crops and vegetable propagation of fruit trees were conducted in private gardens at Akyab and Myohoung Townships by the departmental staff. There has been a keen demand for fruit grafts and seedlings and their distribution is shown in Appendix IV.

KYAUKPYU AND SANDOWAY DISTRICT.

The Senior Agricultural Assistant, Kyaukpyu, was on tour for 122 days. He distributed 829 baskets of paddy and 81 *Theikpan* plough shares and carried out 53 seeds demonstrations and 40 implement demonstrations during the year, in Kyaukpyu, Ramree and Cheduba Townships of the Kyaukpyu District.

The Major seed farm at Kyaukpyu has been extended to another 32 acres, making a total acreage of 85·40 acres for seed propagation.

In the Sandoway District, apart from the pure seed propagation at the Sandoway Jail lands and its dessinmination by the tenant, no proper work has yet been carried out. General advice was given and supply of necessary seeds, fruit grafts, implements, etc., required by the cultivators was made.

Publication.—The following publications were distributed during the year :—

1. Leaflets	...	... 1,500
2. Bulletins	...	... *Nil.*

9. SEED AND IMPLEMENT ADVANCE.

An advance of Rs. 20,000 was alloted during the year. The amonnt utilized for the purpose of seeds and implements as well as the amount refunded are shown in Appendix VII.

Seed loans amounting to Rs. 4,526-11-9 were issued by the Deputy Commissioner, Akyab, to the cultivators in places where there was seed shortage. The Agricultural Department supplied necessary seeds and their costs were settled under book transfer adjustment.

KYAW ZAN,

Deputy Director of Agriculture,
Arakan Circle, Akyab.

Annual Administration Report of the East Central Circle for the year ended the 31st March 1939.

1. Administration.

The Taungdwingyi Subdivision was transferred to the West Central Circle in May 1938 and this Circle at present comprises the Yamèthin and Toungoo Districts and Nyaunglebin Subdivision. Supervision of sericultural work in the hill tracts of the Toungoo District was handed over to this Circle during the year. The Deputy Director acts in an advisory capacity for the Shan States.

Mr. A. Mclean, I.A.S., was Deputy Director up to the 3rd May 1938 when he was relieved by U Thet Su, B.A.S. (I). The Deputy Director was on tour for 199 days of which 35 were spent in the Shan States.

U Ko Ko Gyee, B.A.S. (II), was Assistant Director throughout the year and was on tour for 137 days.

U Khin (1), Senior Agricultural Assistant, was in charge of the Yamèthin Subdivision and the Rural Reconstruction Area at Tatkôn up to the 23rd March 1939 when he was transferred and relieved by U Tun Sein. Total number of touring days was 301.

U E Maung, Senior Agricultural Assistant, was in charge of the Pyinmana Subdivision throughout the year and toured for 253 days.

U Tun (2), Senior Agricultural Assistant, was in charge of the Toungoo Subdivision throughout the year and of the Pyu Subdivision in August and September. He toured for 290 days.

U Ba Tin (2), Senior Agricultural Assistant, was in charge of the Pyu Subdivision except for two months, August and September, when he was on leave and toured for 223 days.

U Ba Thwin, Senior Agricultural Assistant, was in charge of the Nyaunglebin Subdivision throughout the year and toured for 228 days.

U Hla On, Senior Agricultural Assistant, was in charge of the Central Farm at Pyinmana except for the two months, 4th April—4th June 1938, when he was on leave.

U Tun Sein, Senior Agricultural Assistant for the Central Farm, acted as Farm Superintendent when U Hla On was on leave. He underwent training on Tatkôn Farm from the 9th June to 31st October 1938. He was then reposted to the Central Farm and later transferred to Yamèthin to relieve U Khin (1), as Senior Agricultural Assistant, from the 23rd March 1939.

U Tun Hla Aung, Senior Agricultural Assistant, Rural Reconstruction Area, Tatkôn, was appointed Farm Superintendent, Tatkôn Farm, from the 5th May 1938 when he took over from Mr. H. C. D. Pal who was transferred to Mandalay. U Tun Hla Aung remained in charge of the Farm School.

Saw Myat Sein, Senior Agricultural Assistant, was in charge of sericultural work with headquarters at Leiktho throughout the year. He spent 120 days on tour.

At the end of the year, this Circle was short of two Senior Agricultural Assistants.

2. Character of the Season.

The monsoon broke early in the second week of May. The total rainfall was not deficient but its distribution was uneven.

In the Nyaunglebin charge the season was on the whole favourable but reduced yields of *kauklat* paddy in some tracts were attributed to incessant showers before and at the time of flowering in the first three weeks of October. The total rainfall at Nyaunglebin was 115·34 inches (186·32).

In the Toungoo District the early heavy rains delayed broadcast sowing and was detrimental to deep-water paddy sown earlier in low-lying areas. The continuous showers in October were said to be responsible for the low outturn of paddy especially in the Pyu Subdivision. The lack of rain in December caused a partial failure of the *kaing* crops. The total rainfall at Pyu was 133·63 inches (141·91) and at Toungoo 86·06 inches (98·35).

In the Yamèthin District the early showers were weak though many and the sowing of paddy was somewhat delayed. The young sugarcane was much benefited by the early rains, but this crop had suffered from the effect of the untimely showers of December 1937 and never fully recovered from it. The injury was reflected in the low tonnage harvested. At Tatkôn a long spell of drought in July severely affected sesamum and maize and deficiency of rains in October and November reduced the yield of *pesinngon* and beans. The northernmost portions of the District fared better. The total rainfall at Pyinmana was 54·73 inches (49·89) and the average of five stations in the Yamèthin Subdivision was 31·64 inches (36·75).

No serious floods were reported during the year.

3. Agricultural Education.

Ten students joined the Rural Reconstruction Farm School at Tatkôn at the end of May 1938 and nine completed the course of training at the end of February 1939. Seven of the students were from Yamèthin District, two from Toungoo and one from Pegu.

Nine adult cultivators including three from the Shan States were given practical training on the Tatkôn Farm for periods varying from 17 days to 6 months.

Two students from Toungoo District underwent training in sugarcane husbandry and *Kyanthaga* manufacture for two months on the Pyinmana Farm.

At the A.B.M. Agricultural School at Pyinmana, 37 students were admitted during the year making up the total on the roll to 78. Of these 46 completed the session and 12 graduated from the final year.

4. Agricultural Research.

On the the Central Farm at Pyinmana, experiments with sugarcane were carried out.

(*a*) Two varietal tests again showed the superiority of Co. 419 over P.O.J. 2878 in point of yield. The sucrose contents of these two

arieties were the same. Other Co. canes tested also surpassed .O.J. 2878 in yield. The results are shown below :—

Sugarcane Yield Test No. 1.

Variety.	Tonnage per acre	Sucrose per cent.
Co. 419	43·05	16·45
Theikpan No. 1	29·96	13·89
P.O.J. 2878	28·09	16·67
P.O.J. 2714	26·72	15·64
P.O.J. 2727	26·44	13·89
Theikpan No. 2	22·12	14·90

Sugarcane Yield Test No. 2.

Variety.	Tonnage per acre	Sucrose per cent.
Co. 419	46·09	16·61
Co 423	36·02	15·57
Co. 436	31·78	15·03
Co. 408	30·36	14·33
Co 360	23·23	16·21
P.O.J. 2878	21·81	16·33

(*b*) In the manurial experiment with heavy doses of ammonium ılphate, *viz*., 60, 80, 100 and 120 pounds of nitrogen per acre significantly increased yields of 68·57 per cent, 87·36 per cent, 89·36 per cent nd 108·09 per cent respectively were obtained from the manured over ıe unmanured plots. The difference between the yields of plots ıanured with 80 pounds and with 100 pounds nitrogen was not gnificant.

(*c*) The green manure experiment again proved the feasibility of btaining a greater profit by growing green manure than by growing ·samum.

(*d*) The bulky organic manure called "Hyganic" was compared ith ammonium sulphate and Nicifos 2 at the rate of 40 pounds trogen per acre. These three manures respectively gave increased elds of 12·97 per cent, 15·59 per cent and 30·98 per cent over the ımanured control. The better effect of Nicifos over ammonium ılphate is contrary to previous experience.

(*e*) Liming was again found to have no effect on the yield of ıgarcane at Pyinmana.

(*f*) A spacing experiment with 3½, 4, 4½ and 5 feet between rows ıow the 4 foot spacing to be more suitable than the others.

(*g*) No significant differences were found in the effects of the ›acings 14, 18 and 22 inches from centre to centre of pits in the row.

(*h*) In a time-of-planting experiment, it was found that planting in ebruary was not at all advisable and that planting in January even ıve a lesser crop than planting in November or December.

(*i*) Yields of 48·85 tons and 20·95 tons per acre were obtained from ıe first ratoons of Co. 419 and P.O.J. 2878 respectively.

(*j*) Analysis of standing cane late in the season showed a considerble decrease of sucrose in April and May.

On the Tatkòn Farm, a yield test again proved the better yielding capacity of *Pusa* 51 *pesinngon* over *Shwedinga*, New Era, *Pusa* 34 and C. 10.

Among the Soy beans, the Chinese Black bean gave the highest yield with 543 pounds per acre.

The best yielder of the linseeds tried on the Farm was the small seeded variety D.A.C.P. with 524 pounds per acre.

One quarter acre each of Harrison's Special and Adcock cigarette tobaccos grew moderately well on this Farm and yielded 147 pounds rack cured leaves of the former and 115 pounds of the latter variety.

Varietal yield tests with *Kauklat Ngaseins* and Xa hybrids were laid down on the Pyu, Kyauktaga and Pa-aungwe Seed Farms for the Rice Research Officer. *Shannyein* C. 24-71 again proved to be the best yielder among the *Kauklat Ngaseins* with 3903 pounds per acre as an average of three experiments. Xa. 97 with the other hybrids was superior in yield to the local *Ngaseins* Details will be reported by the Rice Research Officer.

Mauritius grass was planted from setts supplied by the Mandalay Farm on paddy field *kazins* of seven seed farms in the Toungoo, Pyu and Nyaunglebin charges. The grass grew well in most cases especially on good soil and was said to be relished by cattle. On the Pyu Farm 90 pounds were reaped from a *kazin* measuring 1½ × 80 feet. One difficulty met with was to keep cattle away from the grass in the hot weather.

Trials on cultivators' holdings—Paddy.—C. 24-71 called *Shannyein* was tried in the Toungoo, Pyu and Nyaunglebin charges on 89 plots covering 43·45 acres The yields were 39·4, 42·6 and 52·2 baskets in the respective charges. A milling test carried out at Pyu gave 65·65 per cent outturn of S.Q. rice by weight. 63·8 per cent of S.Q. rice was obtained in another test in Nyaunglebin. This variety yields better than Maung Nyo B. 24-92 and does not lodge. It is liked by cultivators on this account. The bold hard rice grain and the fairly good milling quality appeal to millers. It is however slightly longer lived than B. 24-92 and is somewhat difficult to thrash.

The hybrid Xa. 97 was grown on 44 plots covering 19·3 acres in the Pyinmana, Pyu and Nyaunglebin charges and the yields were 55, 42·3 and 47·1 baskets per acre respectively. The yields in the Pyu charge would have been greater had the trials been conducted on more suitable land. This strain is favoured by cultivators for its yield and bold grain. But it is somewhat leggy and tends to lodge with strong winds.

B. 15-1 with a short life period was tried on 12 plots of high land in the Pyu charge, yielding only 30·7 baskets per acre, which is not encouraging. The short-lived *Emata* A. 31-12 was grown for early *wunza* on 7 plots covering 3 acres. The yield was only 24·4 baskets per acre. C. 15-10 which is popular in the Yamèthin District was tried in the Toungoo charge on 4 plots covering 2 acres. The yield of 49·4 baskets per acre was considered satisfactory. *Ngaseinkaya* C. 34-119 (Economic Botanist) which was tried on six plots in the Pyu charge failed totally as it was too long-lived.

Sesamums which were tried as late rains crop in the Toungoo and Nyaunglebin failed entirely on account of heavy showers soon after sowing.

Imperial Spanish groundnut which has been successfully established as a *kaing* crop in the Toungoo District was tried in six places in the Nyaunglebin charge. The yields were not high, varying from 15 to 45 baskets, with an average of 32 baskets per acre.

Pesinngon Pusa 51, C. 10 and *Shwedinga* were tried on 17 plots of sandy *indaing* land in mixtures with groundnut in the Pyinmana and Toungoo charges. The results were on the whole disappointing, though one plot of *Pusa* 51 at Kyedaw yielded 10·5 baskets per acre.

The method of taking a crop of gram in paddy plots by broadcasting it a few days before the paddy is harvested is regularly practiced in the Pyawbwè Township Trials of this method were carried out on 113 plots at Tatkôn, and the Pyinmana, Toungoo and Pyu Subdivisions. On dry soils the plants died off within a month while on wetter soils the growth of the plants was fairly satisfactory but fruits were not properly formed. It is said in Pyawbwè that gram has to be sown for about three years successively on any plot of land to produce a good crop of seeds.

Soy beans of four varieties were tried in 4 places in the Toungoo charge as a late rains crop. As in previous years germination was very poor in all cases except in one plot of Kedelee which yielded seven baskets per acre. The *pebok* cakes made from this variety were very much liked by the Shans.

Two varieties of cigarette tobacco, *viz* Harrison's Special and Adcock were grown from seedlings supplied by the Economic Botanist on 12 plots of *ya* land near Pyawbwè, Yamèthin and Pyinmana. Adcock was not successful as it was planted late. Harrison's Special grown near Yamèthin also failed for lack of moisture in the sandy clay soil but the plots near Pyawbwè on loamy soil produced a good stand and a moderate crop of leaves. The average yield of four plots was 477 pounds of rack cured leaves and scrap *plus* 448 pounds of green leaves per acre.

One trial was carried out near Shwègyin with seedlings raised locally, on *kaing* land. The yields per acre of rack cured leaves were 703 pounds of Harrison's Special and 814 pounds of Adcock. Here the crop suffered much from the wilt and leaf curl diseases.

Pachoor, a wrapper leaf tobacco supplied by the Economic Botanist was tried at Shwegyin on a small plot and yielded 833 pounds of dried leaves per acre.

Other crops tried in the Circle include potatoes and Bombay red bulb onions near Tatkôn. Out of ten small plots of the former only one was fairly successful. The latter crop produces a better yield and bigger bulbs and is liked by cultivators.

5. Pests and Diseases.

No serious damage to paddy was caused by pests and diseases.

The top shoots of sugarcane were attacked by the borer *Diatraea* sp. causing a considerable loss of setts. On the Central Farm 5 per cent of setts were found to be affected.

At Tatkôn *pesinngon* suffered from wilt to the extent of 6 per cent and the flowers of the early varieties were damaged by the insect *Maruca testulalis*.

In the Pyu Subdivision, groundnut was affected by a wilt disease associated with the fungus *Diplodia*. In some plots about 5 per cent of the plants were killed.

The wilt disease of tobacco caused by *Bacterium solanacearum* was responsible for the death of 20 to 30 per cent of cigarette tobacco plants at Shwegyin.

A fair number of cultivators in the Yamèthin Subdivision effectively prevented smut of *pyaung* by treating the seed with copper sulphate or sulphur powder.

The control of betel vine mildew by dusting with sulphur powder was successfully demonstrated in the Pyawbwè Township.

6. DEMONSTRATION AND PROPAGANDA.

Crops—(a) *Paddy*.—The most important of the paddy strains advocated in this Circle is Maung Nyo B. 24-92. Although it is complained of as being longer lived than the cultivator's *Letywezin* it is able to withstand conditions of drought in the late rains and is on the whole a better yielder. In the Pyu and in some parts of the Nyaunglebin Subdivisions, the continuous showers of last October were said to be responsible for a reduction in its yield. A premium of Rs. 2 to 3 per 100 baskets was paid for its freedom from red grains by par boilers as well as white rice millers. In a milling test carried out at Pyu, 68·31 per cent outturn by weight of small mills quality rice was obtained. A similar strain with a life period about seven days shorter than this and a better yield will be the most desirable substitute for this paddy.

Altogether 215 plots covering 76·56 acres were laid down in the Pyinmana, Toungoo, Pyu and Nyaunglebin charges and gave yields of 49·7, 37·6, 39·0 and 47·1 baskets per acre respectively.

In the Yamèthin charge the strains demonstrated were *Linbangyaw* T. 34-96, C. 15-10 and *Theikpan Taungdeikpan* on 20 plots covering 15 acres.

Trials with other paddies in this Circle have been mentioned above.

(b) *Sugarcane*.—The abnormal increase of the area under sugarcane in the previous year necessitated an extension of the crushing season of the Zeyawaddy Factory into the first week of July. Many difficulties were encountered by the growers in supplying their cane to the Factory in the proper season and the area planted was consequently very much reduced. The acreage matured in 1938-39 in the Yamèthin District was only 8,713 compared with 13,334 in the previous year and in the Toungoo District 8,830 compared with 8,266 in the previous year. For the first time the area under sugarcane in the Toungoo District has exceeded that in the Yamèthin District. The area in the Nyaunglebin Subdivision was also reduced from 549 to 211 acres.

The Department's efforts in propaganda with respect to this crop were chiefly made in the direction of reducing the cost of production per ton of cane rather than of increasing its area.

A portion of the Sugar Excise Grant was utilized in demonstrating methods of ratooning and application of ammonium sulphate fertilizer at the rate of 2 to 3 cwts. per acre. Altogether 261 plots covering 131·1 acres were laid down in this Circle. Of these 60 per cent were ratoons. Planting of sugarcane in rows was also demonstrated on 32 plots in the Toungoo District. This method is gradually gaining favour among the Indian cane growers though the spacing between rows is still narrow.

(c) *Sesamum*.—The Economic Botanist's selection *Shwepolhagaung* which is a good yielder and fairly resistant to drought and *Pokepyi*

were demonstrated either singly or mixed with *pèsinngon* on 102 plots covering 107·25 acres in the Yamèthin District. Failures were reported of late sesamum trials in Toungoo and Nyaunglebin charges.

(d) *Groundnut.*—Imperial Spanish groundnut whose life period permits of a cold season crop being taken after it, was demonstrated singly or in combination with *pèsinngon* on *ya* lands in the Yamèthin District and Toungoo Subdivision. As a cold weather crop it has become established on the *kaings* of the Toungoo District and on light soils after paddy in the Pyu Subdivision. Further demonstrations on such lands were carried out to encourage extension of the area under this crop. Trials in the Nyaunglebin charge gave smaller yields than in the north. A few demonstration plots were grown with the spreading groundnut in suitable areas in the Yamèthin charge. On sandy *indaing* soils the comparative merits of erect and spreading types of groundnuts remain to be tested. Altogether 157 demonstration plots of groundnut covering 125 acres were laid down in the Circle.

(e) *Pesinngon.*—Pusa 51 which is an erect variety with large seeds yields well and fetches a premium was widely demonstrated in the Yamèthin charge in crop combination with sesamum, groundnut, maize and chillies. *Shwedinga* was sown on a lesser number of plots. The total number of demonstration plots of this crop was 181 covering 210 acres. Failure of trials on *indaing* soils in the Pyinmana and Toungoo charges has been recorded above.

(f) *Gram.*—Trials of this crop in paddy fields have been referred to.

(g) *Malpe.*—*Malpe* was demonstrated as a *ya* crop on 18 plots in the Yamèthin District and as a *kaing* crop on 22 plots in the Pyu and Nyaunglebin charges. This crop which was very successful on flooded land in the previous year suffered a set back as it was greatly affected by the deficiency of late rains. In the Pyu charge the average of 12 plots yielded 7·2 baskets only as against 15·2 in the previous year.

(h) *New Era Pelun.*—This American cowpea is a prolific yielder and is much appreciated by cultivators. It was demonstrated on 25 plots of *kaing* land in the Toungoo and Pyu charges and yielded 16 and 21 baskets per acre respectively.

(i) *Other pulses.*—Other pulses of which demonstration plots were laid down were *Pegyi* (35), Butter beans (10), Soy beans (15) and *pedisein* (12), the last in the Nyaunglebin charge and the first three in Yamèthin.

(j) *Tobacco.*—Pennsylvania and Harrison's Special tobaccos cured in the ordinary way were demonstrated on 26 plots of *kaing* land in the Toungoo District. The latter variety found some use as *dahlise* (cut tobacco) in one place.

(k) *Miscellaneous crops.*—Miscellaneous crops demonstrated were cotton (10), maize single (50), mixed (69) and linseed (4) in the Yamèthin District, and onions (4) in the Pyu Subdivision.

Line sowing.—Line-sowing was shown in the demonstration plots of all the above crops except paddy.

Manurial Demonstration.—Manuring of paddy nurseries with Nicifos 2 at the rate of 100 to 150 pounds per acre was demonstrated on 168 plots throughout the Circle. The increase in the number of *pyo* bundles per acre was 177 in the Pyu charge and 571 in the Pyinmana charge. The *pyos* were bigger and could be planted seven to ten days earlier than unmanured *pyo*.

Application of ammonium sulphate to sugarcane has been mentioned above. The same fertilizer applied to onion beds at the rate of 150 to 200 pounds per acre was demonstrated on 15 small plots in the Yamèthin charge. 18 to 20 per cent increases in yield were obtained.

Green manuring for this crop was demonstrated in Pyawbwè Township on 4 plots. About 30 per cent increase in yield was obtained from one plot applied with farmyard manure and green manure over one applied with farmyard manure alone. This form of manuring will be practised by a fair number of onion growers in this tract.

Manuring of tobacco on *kaing* land with 200 pounds of Nicifos and 100 pounds of potassium sulphate was tried on 4 plots in the Pyu charge. The results are not yet known.

The proper method of storing farmyard manure was demonstrated in 36 pits in the Yamèthin and Toungoo charges.

Fungicides.—The control of betel vine mildew by dusting with sulphur powder was again shown in 6 places in Pyawbwè Township. The disease was effectively checked by this treatment at a small cost and betel vine growers are now keen to adopt this method.

Implements.—Demonstrations of handling the *Theikpan* plough and of its action were done in 143 places throughout the Circle.

Intercultivation with the Planet Junior cultivator was demonstrated in 49 places in the Yamèthin, Pyinmana and Toungoo charges.

Intercultivation with the ordinary wooden cultivator *Htundogale* was shown on 4 plots of *kaing* in the Pyu charge.

Sowing by means of a seed drill was demonstrated on 4 other plots of *kaing* in the same charge.

The intensive method of demonstrations followed during the past two years at Tatkôn, Kyette, Ywatha and Shawbyugaing in the Yamethin Subdivision has resulted in the adoption of improved seeds and methods by the majority of cultivators in those tracts and it is hoped that a complete change over to better agriculture in those tracts will be brought about within the next few years. An extension of this method will be made to other suitable areas in the Circle.

In the paddy areas, where premium for quality is offered only on large bulks of seed, this method of propaganda would appear to be suitable.

Agricultural Shows and Exhibitions.—The Yamèthin District Agricultural and Cattle Show was held on the 3rd and 4th March at Pyinmana in conjunction with the Lawkamarazein Pagoda Festival. It was supported by financial contributions of the Agricultural Department, the local bodies and the public. The co-operation of officers of the various departments of Government helped to make it a success. Prizes were offered for various kinds of agricultural produce, cattle, ponies, poultry and home industries to successful competitors from all over the District. A large number of people especially from the surrounding villages attended the show and for their benefit, exhibitions were staged by the Public Health, Police, Forest and Agricultural Departments.

Similar exhibitions of agricultural products and implements were put up at the Mogaung Pagoda Festival at Zayatkyi and Myatsawnyinaung Pagoda Festival in Toungoo District and at the Rural Reconstruction Training camps held at Nyaungbintha, Toungoo District and Tatkôn, Yamèthin District.

The training camp at Tatkôn was organized by the Burma Rural Reconstruction League and was attended by about 500 trainees from all

over Burma. It lasted for ten days. In addition to the exhibition, lectures were delivered by officers of the Department and demonstrations of improved crops and implements given to the trainees.

Other forms of propaganda included 69 lectures delivered to meetings of cultivators and direct approaches made to individual cultivators or small groups of them by informal talks on the part of demonstrators and Senior Agricultural Assistants. This latter method of propaganda has proved to be the most effective.

Distribution of improved seeds for each charge are shown in pounds in the following table :—

Crops.	Yamèthin.	Pyinmana.	Toungoo.	Pyu.	Nyaunglebin.	Total for Circle.	
						1938-39.	1937-38
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Paddy—B. 24-92	...	21,650	61,300	217,450	258,700	...	...
Theikpan Taungdeikpan.	125,000	300	...	...	...	...	...
T. 34-96	6,000	...	...	...	...	...	...
C. 24-71	...	...	700	1,950	61,300	...	...
C. 14-8	...	...	...	...	46,600	...	...
C. 15-10	37,500	1,800	200	...	...	...	...
C. 28-15	...	...	1,150	...	...	...	...
Mandalay *Ngasein.*	6,500	...	...	...	...	...	...
D. 17-88	...	...	24,600	5,000	...	...	...
Xa. 97 ...	...	1,000	...	1,200	50,350	...	...
Other paddies.	...	5,350	900	450	...	...	...
Total, Paddies ...	175,000	30,100	88,850	226,050	416,950	936,950	1,141,011
Groundnut ...	20,000	4,312	6,660	90,760	3,192	124,924	113,218
Sesamum ...	9,000	650	252	210	...	10,112	7,745
Beans—*Pèsinngon*	27,000	630	52	...	...	...	...
Maipe ...	17,500	2,223	175	10,001	...	...	...
Other beans.	13,738	400	784	1,756	...	...	...
Total, Beans ...	52,238	3,253	1,011	11,757	...	68,259	74,750

Crops.	Yamèthin	Pyinmana.	Toungoo.	Pyu.	Nyaunglebin.	Total for Circle.	
						1938-39.	1937-38.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gram ...	51,000	1,260	870	11,160	...	64,290	52,540
Wheat ...	...	100	...	...	...	100	600
Millets ...	3,480	660	..	...	...	4,140	20,436
Miscellaneous ...	14,400 (a)	330	363	4,255 (b)	...	19,348 (c)	27,482
GRAND TOTAL ...	325,118	40,665	98,006	344,192	420,142	1,228,123	1,460,092
Sugarcane setts ...	500,000	65,000	...	4,000	...	569,000	1,494,000

(a) Includes 14,000 lbs. onion bulbs. (b) Includes 3,690 lbs. onion bulbs. (c) Includes 17,690 lbs. onion bulbs.

There was a considerable decrease in the quantity of seed paddy distributed as the untimely rains of December 1937 damaged the paddy on seed farms in the three southern charges and most of it was not utilized for distribution. The decrease would have been greater but for increased sales of the new crop towards the end of the year under report.

In the Yamèthin charge *Theikpan Toungdeikpan* and C. 15-10 continued to be popular, the first for the quality of its rice and the second for its good yield with a long life period. *Maung Nyo* B. 24-92 had made good headway in the remaining charges of the Circle. In the Nyaunglebin charge C. 14-8 is still much favoured in low lying tracts for its compact growth and a fair yield. It fetched a premium of Rs. 10 to 15 per 100 baskets during the year under report as it was the only variety that could be milled into white rice when the others which were affected by the December rains could not be milled in this way. Xa. 97 which yields well was considered as a possible substitute for C. 14-8 which is very susceptible to pests. But the tall growth of the former is criticised by cultivators. It will however take on where there is no C. 14-8 in that charge. *Shannyein* C. 24-71 with its good yield is another promising strain for this and the Pyu charges. There was a large demand for the deep water paddy *Sitpwa Yemanaing* C. 28-15 in the Toungoo charge but it could not be met for lack of seed. In this charge *Kamakyi Midôn* D. 17-88 is offered a premium of Rs. 5 per 100 baskets for its rice quality but this paddy is not a high yielder and it will be well to obtain a high yielding substitute for it.

Sugarcane is second in importance to paddy in the work of this Circle. Experiments carried out for the past four years have conclusively proved that Co. 419 is much superior to P.O J. 2878 in yield and the four small trials carried out in the Pyinmana Subdivision on cultivators' land were attended with success. There is also an incessant demand for this cane by cane growers. It was therefore decided to release it for distribution. Altogether 35,000 setts were distributed among 70 growers in the Pyinmana Subdivision and 4,000 among 3

growers in Pyu Subdivision. All available space on the Pyinmana Farm has been utilized for multiplication of this variety and there is no doubt that the cultivators who received the small quantities of setts will resort to short planting for multiplying it.

Owing to the slow rate at which cane had to be delivered to the Factory there was a dearth of planting material and setts of P.O.J. cane and others were much sought after.

The Imperial Spanish groundnut has spread further on the *kaings* of the Pyu Subdivision and on light soils after paddy. Seed for this crop has to be imported from the Yamèthin District.

Among the beans, *Pusa* 51 *pèsinngon* continues to be in demand for its high yield, large grain and erect habit.

The acreage under improved crops which have been estimated roughly are shown in the following list charge by charge :—

Crop.	Yamè-thin.	Pyin-mana.	Toun-goo	Pyu.	Nyaung-lebin.	Total for Circle.	
						1938-39.	1937-38.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Paddy ...	17,320	2,686	12,740	81,959	57,901	172,606	1,71,266
Sugarcane ...	170	8,423	1,270	7,024	150	17,037	20,497
Gram ...	1,850	30	...	744	..	2,624	1,956
Groundnut ...	1,400	128	308	1,307	40	3,183	2,652
Sesamum ...	2,400	104	636	48	...	3,188	3,303
Pesinngon ...	3,000	75	...	50	...	3,125	7,645
Matpe ...	...	...	...	1,000	...	1,000	992
Maize ...	...	...	...	100	...	100	5,095
Onions ...	...	...	...	45	...	45	50
Total ...	26,140	11,446	14,954	92,277	58,091	2,02,908	213,456

Seed Farms.—During the year under report 15 seed farms covering 1,350·89 acres of paddy land were worked by tenants of the Department. Of these one farm of 10·65 acres was handed over to this Department at the beginning of the year. This is the only Government seed farm for the Yamèthin charge and is quite inadequate. Its water supply is precarious. Most of the seed distributed in this charge was obtained from 27 private seed farms with a total area of 470 acres.

The Pyinmana charge also possesses only one seed farm of 19·26 acres. The water supply on this farm is uncertain and parts of it are suitable only for dry crops. Four private seed farmers worked 33 acres of paddy.

In the Toungoo charge there are four seed farms of which two have been fully cleared. The work of jungle clearing on the Kongyi Farm was satisfactorily carried out during the year but Pade Farm is still largely under thick jungle. Seed for distribution was obtained from two seed farms only covering 175 acres. Out of these Kelingon Farm

near Yadashè yielded only 17·6 baskets per acre, the soil being very poor. Satisfactory tenants could not be found for this farm. There are five private seed farms covering 255 acres.

There are four seed farms with a total area of 813·79 acres in the Pyu charge. Of these, Sibintha Farm has always been unsatisfactory. Another case of encroachment occurred and 10 acres had again to be surrendered. No seed was taken from this farm for distribution. A general reduction in yield was reported from all the seed farms in this charge. This probably was due to seasonal causes. But the soil of the Oktwin Farm appeared to have deteriorated. On some portions the crop almost failed and one tenant absconded without paying rent. There are 20 private seed farms with a total area of 1,940 acres.

Nyaunglebin charge is comparatively more fortunate with five farms covering 212·19 acres of good land. Pothet-hnan Farm has been almost completely cleared of jungle. Sanction to acquire an extension of 24·18 acres to the Nyaunglebin major seed farm has been obtained. This will make the total area of the farm to 41·37 acres.

Just after the end of the year an exclusion of 30 acres from a grazing ground in the Toungoo Subdivision and one resumed holding of 12 acres in the Pyinmana Subdivision were transferred to this Department.

Further observations of grazing grounds in the Nyaunglebin, Pyu and Toungoo charges were made with a view to utilizing suitable portions as seed farms.

Distribution of Fertilizers.—The following table shows the quantities in pounds of Nicifos used on paddy nurseries and of ammonium sulphate on sugarcane.

Charge.	Nicifos.	Ammonium sulphate.
Yamèthin	...	..
Pyinmana	4,361	66,058
Toungoo	4,640	12,544
Pyu	7,440	2,22,208
Nyaunglebin	1,360	2,464
Total for Circle 1938-39 ...	*17,801*	*3,03,274*
Total for Circle 1937-38 ...	*11,872*	*81,805*

The increase in the quantities used especially of ammonium sulphate is striking. In Pyu charge the large distribution is accounted for by the Zeyawaddy Sugar Factory's issue of 94 tons of ammonium sulphate to sugarcane growers as loans.

IMPLEMENTS.

Demonstrations of various improved implements have been described above. The most important implement distributed is the *Theikpan* ploughshare of which 833 (1,135) were sold departmentally

and 3,300 by makers in the Circle during the year. In addition to these 2,075 were supplied to other Circles. The following table shows the number of implements distributed by the Department in each charge :—

Charge.	*Theikpan* share.	Planet Junior Culti-vators.	Other Imple-ments.
Yamèthin ...	465	47	98
Pyinmana ...	10	...	...
Toungoo ...	70	...	...
Pyu	257	...	2
Nyaunglebin ...	31	...	...
Total for Circle 1938-39	833	47	100
Total for Circle 1937-38	1,135	63	...

Had it not been for the drought which prevailed in the Yamèthin Subdivision a larger number of Planet Junior Cultivators would have been sold. Among "other implements" 67 ridging shovels for the Planet Junior Cultivator were included. The improved hay-fork and and the sesamum sowing tube have also found much favour. The latter is made of bamboo and can easily be made by cultivators. It is a cheap and handy implement which enables speedy sowing of sesamum in rows without stooping.

8. PUBLICATIONS.

A handbill in Hindustani on the advantages of improved paddy seed was prepared and 1,000 copies of it distributed in the Kyauktaga grant. Altogether about 12,700 leaflets on agricultural subjects were distributed in the Circle.

9. SEED AND IMPLEMENT ADVANCE.

The amount of the advance sanctioned for the year was Rs. 27,000. The largest portion of it was utilized in transactions connected with paddy of which 7,577 baskets (11,471) valued at Rs. 5,705-15-3 were sold and towards the end of the year 12,092 baskets (5,947) of new seed value at Rs. 8,848-13-0 and gunnies worth Rs. 1,285-7-6 were bought.

Groundnuts were next in importance. 5,197 baskets (2,666) of this valued at Rs. 5,193-2-0 were handled. Of pulses 348 baskets valued at Rs. 920 and miscellaneous seeds valued at Rs. 1,554-2-6 and sugarcane setts valued at Rs. 29-14-0 were dealt with.

The most important among the implements were ploughshares of which 3,384 valued at Rs. 2,873-4-0 were handled and 62 Planet Junior Cultivators valued at Rs. 1,267-1-0. One Phoenix Sugar Centrifugal machine was sold at Rs. 250 and various small implements and accessories valued at Rs. 164-15-0. The year's working resulted in a net profit of Rs. 1,023-4-0.

Agriculturists Loans.—The practice of recommending few selected applicants for these loans was continued by the Senior Agricultural Assistants.

10. MISCELLANEOUS.

Sericulture.—The history and objects of sericultural work in the Toungoo District and of the Leiktho and Thagweplo Sericultural Stations will be found in the reports of the Entomologist, Burma. The area is in charge of one Senior Agricultural Assistant assisted by two fieldmen. The Deputy Director, the Assistant Director and the Senior Agricultural Assistant toured in this charge for 15, 11 and 120 days respectively during the year.

The main work consisted of growing mulberry, rearing of silk worms, reeling of silk and training of students at the two stations and demonstration and distribution of improved silk worm eggs and mulberry in the villages.

There were 10 acres of mulberry plantation attached to the stations. Of these three had been cleared but remained to be planted. The best growth was on terraced plots which had been under rice. On upland plots the growth was not satisfactory. It appears that there is room for a type of mulberry which is more suitable for this tract. The villager grows his mulberry on shifting *taungyas* but there are now 15 acres of permanent mulberry plantation grown according to advice from the Department. No improved mulberry was distributed during the year.

Of the varieties of silk worm handled at the stations Nistid was the most popular on account of its hardiness, but it does not yield so much silk as Itab. The total quantity of improved seed distributed in the year was 8,453 layings (11,062) and 340 seed cocoons (2,100). The decrease in distribution is attributed to less demand from the villagers who complain that the improved types are less hardy than the local. The need for a hardier strain with high yield is indicated.

Six girls and one boy were trained at the stations on monthly stipends of Rs. 4 and Rs. 8 each respectively.

The Senior Agricultural Assistant delivered five formal lectures in the charge and gave informal talks on sericulture and agricultural improvement in every village visited.

MAUNG THET SU,
Deputy Director of Agriculture,
East Central Circle, Pyinmana

Annual Administration Report of the Northern Circle for the year ended the 31st March 1939.

ADMINISTRATION.

There were three changes in the Deputy Directors of Agriculture during the year. U Tun Yee, B.A.S. II, Acting Deputy Director of Agriculture, held charge of the Circle from the beginning of the year to 23rd May 1938 when he was transferred as Acting Deputy Director of Agriculture, Tenasserim Circle. On that date U Saw Tun, B.Ag., A.T.M., B.A.S. II, who was promoted to the Burma Agricultural Service Class I, held charge of the Circle until the 25th March 1939 and I held charge of the Circle till the end of the year

U Tun Yee toured for 24 days and U Saw Tun for 146 days. No touring was done by me as Deputy Director of Agriculture. The total number of touring days by the Deputy Directors of Agriculture is 170 days.

U Tha Dun, Officiating B.A.S. II, was the Assistant Director of Agriculture from the beginning of the year until the 14th March 1939 when he proceeded on 4 months' leave. He was relieved by U Ba Maung, B.A.S. II, who was posted to this Circle on return from 4 months' leave. U Khin (1), B.Ag., Senior Agricultural Assistant, Yamèthin, who was promoted to officiate in the Burma Agricultural Service Class II was posted to this Circle on the 25th March 1939 as Assistant Director of Agriculture in place of U Ba Maung, B.A.S. II, who officiated in the Burma Agricultural Service Class I. U Khin, B.Ag., Officiating B.A.S. II, held charge of the Assistant Director of Agriculture, Northern Circle, till the end of the year.

U Tha Dun toured for 51 days, U Ba Maung for 4 days, and U Khin for 1 day. The total number of touring days by the Assistant Directors of Agriculture is 56 days.

The Circle List is as under :—

Charge. (1)	Head-quarters. (2)	Held by (3)	Period. (4)	No. of touring days. (5)
1. Central Farm ...	Kanbalu	Mr. T. J. Cook, S.A.A.	1st April 1938 to 6th June 1938.	12
		U Maung Maung, S.A.A	6th June 1938 to 5th August 1938.	...
		Mr. T. J. Cook, S.A.A.	5th August 1938 to 31st March 1939.	...
2. Mandalay South	Mandalay	U Tha Dun, A.D.A.	1st April 1938 to 31st May 1938.	8
		U Ba Khin, S.A.A.	1st June 1938 to 3rd January 1939.	125
		U Tha Dun, A.D.A.	4th January 1939 to 3rd March 1939.	38
		U Ba Khin, S.A.A.	4th March 1939 to 31st March 1939.	18

Charge. (1)	Head quarters. (2)	Held by (3)	Period. (4)	No. of touring days. (5)
3. Mandalay North	Mandalay	U Tun Tin, S.A.A.	Throughout the year.	168
4. Sagaing Township and Padu Seed Farm.	Sagaing	U Hla Paw U, S.A.A.	Do.	182
5. Shwebo South and Chiba Seed Farm.	Shwebo	U Tun On, S.A.A.	Do.	192
6. Shwebo West and Ye-U Seed Farm.	Ye-U ...	U Mya Han, S.A.A.	Do.	184
7. Shwebo North ...	Kanbalu	U Maung Maung, S.A.A.	1st April 1938 to 31st Oct. 1938.	116
		Mr. T. J. Cook, S.A.A.	1st Nov. 1938 to 30th Nov. 1938.	12
		U Maung Maung, S.A.A.	1st Dec. 1938 to 31st March 1939.	...
8. Myitkyina and Mohnyin Seed Farm.	Myitkyina	Mr. Zao Lawn, S.A.A.	Throughout the year.	191
9. Kyauksè District, Singaing and Myittha Seed Farms.	Kyauksè	U Thin Nya, J.A.A.	Do.	233
10. On special duty in connection with Sugarcane.	Singaing	U Ba Khin, S.A.A.	1st April 1938 to 31st May 1938 and 5th January 1939 to 3rd March 1939.	...

Mr. T. J. Cook, Senior Agricultural Assistant and Farm Superintendent, Kanbalu, went on leave for 2 months with effect from the 6th June 1938 when U Maung Maung, Senior Agricultural Assistant, Shwebo North, Kanbalu, held charge of the farm in addition to his own duties.

U Maung Maung, Senior Agricultural Assistant, Shwebo North, Kanbalu, went on leave for 1 month from the 1st November 1938 when Mr. T. J. Cook, Senior Agricultural Assistant and Farm Superintendent, Kanbalu, held charge of the district work of Shwebo North in addition to his own duties.

U Ba Khin, Senior Agricultural Assistant, continued to remain on special duty in connection with sugarcane at Singaing from the beginning of the year. He was transferred to Mandalay on the 31st May 1938 when he took over the duties of the district work of Mandalay South from U Tha Dun, Officiating Assistant Director of Agriculture, who held charge of that post in addition to his own duties since the beginning of the year. U Ba Khin was re-posted to Singaing on the 5th January 1939 on the same special duty until he was again re-posted on the 4th March 1939 to the Mandalay South Charge, which post he held till the end of the year. During the period U Ba Khin was reposted to Singaing, U Tha Dun, Assistant Director of Agriculture, held charge of the Mandalay South in addition to his own duties.

Among the clerical staff Maung Ba Thein, Head Clerk, went on leave for 1 month from the 17th January 1939 when Maung Kyu, 2nd Clerk, was appointed Officiating Head Clerk in his place. Maung Ba U, 3rd Clerk, was appointed as 2nd Clerk in place of Maung Kyu and Mr. J. B. Dragon, an apprentice clerk, was appointed as 3rd Clerk in place of Maung Ba U.

Mr. G. W. Unger, Farm Clerk, went on leave for 2 months from the 15th August 1938 when Mr. J. B Dragon, apprentice clerk, was appointed Officiating Farm Clerk in his place.

The services of Mr G. W. Unger, Farm Clerk, were transferred to the office of the Veterinary Reserch Officer, Insein, from the 20th February 1939 when Mr. J. B. Dragon, apprentice clerk, was appointed Officiating Farm Clerk in his place.

The following is the distribution of Fieldmen in the Circle :—

Kanbalu Central Farm.

1. Maung Kywe was attached to the farm throughout the year.
2. Maung Ba Nyan was attached to the farm throughout the year.
3. Maung Tun Shein was appointed 3rd Fieldman on the 1st June 1938 and was attached to the farm until the 28th February 1939 when he resigned. He went on leave for 15th days without pay from the 17th October 1938.
4. Maung Kyi Han was appointed 3rd Fieldman on the 27th March 1938 and was attached to the farm until the end of the year.

Mohnyin Seed Farm.

1. Maung Pan Nyun was attached to the farm throughout the year.

Chiba Seed Farm.

1. Maung Chit Ti was attached to the farm throughout the year.
2. Maung Lwin, being appointed Fieldman on 1st April 1938, was attached to the Ye-U Seed Farm throughout the year.

Padu Seed Farm.

1. Maung Po Tun was attached to the farm throughout the year.
2. Maung Ba Shwe was attached to the Senior Agricultural Assistant, Sagaing, throughout the year. He went on leave for 2 months from the 5th November 1938.

Singaing Seed Farm.

1. Maung Thein Maung was appointed Fieldman on the 1st May 1938 and was attached to the farm until the end of the year.
2. Maung Aung Khin was appointed Fieldman on the 1st May 1938 and was attached to the Myittha Minor Seed Farm until the end of the year.

Character of the Season.—Throughout the Circle the early rains were very heavy and in many cases they exceeded much the average of the last ten years. These were therefore very beneficial to the preparation of land for all kinds of crops in the Circle. In the Sagaing Township it was too much for cotton and other "**Ya**" crops. In the Myitkyina District it was normal.

There was very little rain in June, July and August 1938 when all the crops both paddy and "**Ya**" suffered greatly. In the Myitkyina District the rainfall in these months was so good that transplanting of

paddy was completed in time. In the irrigated areas of Mandalay, Kyauksè, Shwebo and Ye-U paddy crop suffered to some extent for want of water.

A good rainfall in October 1938 and a downpour in November 1938 occurred throughout the Circle when some of the low-lying areas were flooded. On the whole late rain was beneficial to paddy. In the Sagaing Township sprouted wheat and gram were damaged by these rains and on account of subsequent late re-sowing and consequent late harvesting the yields of these crops were low. In the Irrawaddy riverine areas of the Mandalay and Sagaing Districts and the Mu riverine areas of the Shwebo District, "Kaing" crops such as chillies, groundnuts, tobacco, etc., suffered from flood caused by the rise of these rivers. The following table shows the distribution of rainfall of the year under report compared with previous years, charge by charge :—

District.	Rainfall in 1938-39.		Rainfall in 1937-38.		Average rainfall for last ten years.
	Days.	Inches.	Days.	Inches.	
(1)	(2)	(3)	(4)	(5)	(6)
Mandalay South ...	58	39'32	62	42'03	32'18
Mandalay North ...	78	50'28	73	46'73	42'19
Sagaing Township ...	45	42'04	46	34'58	28'14
Shwebo South ...	64	43'07	56	37'77	43'76
Shwebo West ...	47	47'62	61	43'29	36'50
Shwebo North ...	74	55'17	93	45'44	40'70*
Myitkyina ...	115	94'13	99	90'03	89'96*
Kyauksè ...	79	43'14	74	37'75	31'07

NOTE.—* The average rainfall of 40'70 inches is for nine years and that of 89-96 for seven years.

AGRICULTURAL EDUCATION.

(a) *Agricultural Training.*—Training of adult cultivators was continued at the Kanbalu Central Farm under the the supervision of the Farm Superintendent. The following is a statement showing the period of training that was given to them. Making of plough frames, fitting them with plough shares of all sizes, making of seed drills and harrows by the students and the use of these implements were items of some of the important lessons given to them. With the exception of the two all the remaining ten students completed their courses successfully.

Deputed from	Number.	Period of training and remarks.
Shwebo South ...	1	4 months.
Shwebo West ...	1	6 months.
Do. ...	1	Attacked with malaria and left.
Do. ...	1	Did not complete the course.
Shwebo North ...	1	6 months.
Kyauksè	1	5 months.
Myitkyina	5	6 months } These are Kachin lads.
Do. ...	1	5 months } These are Kachin lads.
Total ...	12	

(b) *Lectures on Agricultural Subjects.*—Apart from the lectures hich are listed below the assistants have continued to take every pportunity of giving short talks to a number of cultivators on various gricultural subjects suitable for the occasion during their tours:—

Name and Designation of officer. (1)	No. of lectures. (2)	Subject of lectures. (3)	With or without lantern-slide. (4)	Number attending. (5)
Ba Khin, S.A.A., Mandalay South.	2	Selected seed, storage of Farm Yard Manure, line-sowing, mixed cultivation, double cropping, use of artificial manure and cattle breeding.	1 with, 1 without	4,500
Tun Tin, S.A.A., Mandalay North.	16	Do.	Without	646
Tun On, S.A.A., *Shwebo South.*	36	Theikpan ploughs, intercultivators, *compost pits and preservation* of Farm Yard Manure.	Do	1,760
Mya Han, S.A.A., Shwebo West.	27	Pure seeds, Theikpan ploughs, improved implements and improved agriculture.	Do.	544
Maung Maung, S.A.A., Shwebo North.	1	Improved agriculture ...	Do.	30
Thin Nya, J.A.A., Kyauksè.	14	Do. ...	Do	625
Do	2	Do. ...	With ...	1,000
Hla Faw U, S.A.A., Sagaing.	32	Theikpan ploughs, line sowing of cotton, groundnuts, *pesinngon*, composts and contour bunding.	Without	795
r. Zao Lawn, S.A.A., Myitkyina.	17	Improved agriculture ...	Do.	168

(c) *Agricultural Education and Shows.*—On account of the nsettled state of the country in general, many agricultural shows that ere proposed to be held at various pagoda festivals and fairs had to e dropped out. It was therefore possible for the staff to attend to our shows only during the year as under :—

Charge. (1)	Place. (2)	Date. (3)	Kind. (4)	Attendance. (5)
Mandalay South.	Maymyo ...	2nd April 1938 ...	Flower and Poultry Show.	700
Shwebo West.	Ye-U ...	27th—29th December 1938.	Rural Reconstruction Show.	1,000
Kyaukse ...	Myittha ...	30th January 1939 and 1st February 1939.	Cattle and Produce Show.	10,000
Mandalay South.	Shwezayan ...	10th—12th March 1939.	Agricultural Show	10,000

(d) *Agricultural Leaflets.*—As usual leaflets on important agricultural subjects were distributed at all the shows and places of lectures and also during their tours by the district assistants. A large number of these is always required every year for distribution to *bona-fide* cultivators.

AGRICULTURAL RESEARCH.

The following experiments were conducted in the Circle during the year :—

1. *Myitpo.*—In collaboration with the Economic Botanist, Burma, experiments were conducted at Chiba and Ye-U Seed Farms. The plots where experiments were conducted last year were halved ; one half being treated in the manner described in this year's experiment and the other half left untreated so as to study the residual effect of the manures applied last year.

Arrangements of plots :—9 × 5 randomised blocks with 2 sub-plots in each plot.

Treatments are :—

(1) Control.
(2) N_1 :—10 lbs. Nitrogen as Ammonium Sulphate.
(3) N_2 :—20 lbs. Nitrogen as Ammonium Sulphate.
(4) N_1P_4 :—10 lbs. Nitrogen as Ammonium Sulphate *plus* 40 lbs. Phosphate as Superphosphate.
(5) N_2P_8 :—20 lbs. Nitrogen as Ammonium Sulphate *plus* 80 lbs. Phosphate as Superphosphate.
(6) P_4 :—40 lbs. Phosphate as Superphosphate.
(7) P_8 :—80 lbs. Phosphate as Superphosphate.
(8) F.Y.M.$_2$:—20 lbs. N_2 as Farm Yard Manure.
(9) F.Y.M.$_4$:—40 lbs. N_2 as Farm Yard Manure.

Final Results for Chiba.

Yeild in lbs. (Total of 5 plots).

S.E. for comparison between treatment forming a pair = $\pm$ 3·4986.

S.E. for comparison between treatment not forming a pair = $\pm$ 4·2000.

—	C	N_1	N_2	N_1P_4	N_2P_5	P_4	P_5	F.Y.M.$_2$	F.Y.M.$_4$	S.E.
	A	B	C	D	E	F	G	H	I	10·4958.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
										Total.
Remanured	71·00	83·75	94·75	103·75	105·75	95·50	104·00	93·75	90·75	843·00
Residual	66·50	64·25	66·50	82·50	77·75	74·50	68·50	68·25	67·75	636·50
Total S.E. = 6·7890 ...	137·50	148·00	161·25	186·25	183·50	170·00	172·50	162·00	158·50	

(1) D E G F H C I B A

(2) Remanuring is decidedly superior.

Final Results of Ye-U.

Yield in lbs. (Total of 5 plots).

S.E. for comparison between treatments forming a pair = $\pm$ 6·2905.

S.E. for comparison between treatments not formining a pair = $\pm$ 5·9950.

	C	N_1	N_2	N_1P_4	N_2P_8	P_4	P_8	$F.Y.M._2$	$F.Y.M._4$	S.E.
	A	B	C.	D	E	F	G	H	I	18·8915.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
										Total.
Remanured	11·15	7·89	8·07	90·88	97·27	81·29	114·00	43·82	76·00	530·37
Residual	12·30	7·14	17·63	24·04	66·34	34·75	59·18	10·91	25·80	258·99
Total S.E. = 8·038 ...	23·45	15·03	25·70	115·82	163·61	116·04	173·18	54·73	101·80	

(1) G E F D I H C A B.

(2) Remanuring is decidedly superior.

According to the results obtained the application of phosphate controlled the disease and re-manuring gave decidedly superior yields. Detailed results on other experiments on " Myitpo " the Economic Botanist, Burma's and the Agricultural Chemist, Burma's reports for the year may be consulted. The Mycologist, Burma, however, observed the presence of " Eel Worms " in both the affected and healthy plants but more so in the affected ones. Whether the worms or other soil fauna cause the disease is going to be explored by the Specialist Officers of the Agricultural Department during the next season.

It should however be stated that the damage done by " Myitpo " in the Shwebo and Ye-U Canal Areas was very little this year possibly due to good early rains and fair distribution subsequently during the growing season.

Three varieties of paddy, *viz.*, *Shannyein*, *Dawe* and *Ekale* from Lower Burma known to be resistant to salinity were tried with a view to finding out their immunity to " Myitpo ". None of these varieties were resistant.

2. *Amyitpo.*—For the first time, a disease known as " Amyitpo " on paddy was noticed in the Mandalay South Charge. The disease appeared soon after transplanting and produced drying and curling up of the outer leaves leaving the central shoot green. The affected plants were in general stunted. The disease is attributed by the cultivators to looseness of the soil probably due to alkalinity. The Agricultural Chemist, Burma conducted experiments in three different places on plots measuring 3′ × 3′ with 9 treatments replicated 3 times. The plants were studied in the fields and the crop harvested and grains weighed by the Agricultural Chemist, Burma. Only the highest dose of P_2O_5 (120 lbs. per acre) controlled the disease. The other treatments have no response. The pH value of the soil was about 8·01. The details of the experiments may be seen in the Agricultural Chemist, Burma's report for this year. The experiment will be repeated next year.

3. *Onion Leaf Disease of Paddy.*—In collaboration with the Entomologist, Burma, 12 plots were treated with doses of 80 lbs., 90 lbs., 100 lbs. and 112 lbs. per acre of Nicifos 2 at Meza, and series of 4 plots each at Manle, Indaw and Mawlu all in the Katha District by the Senior Agricultural Assistant, Myitkyina, to study the incidence of this disease. The plots at Manle and Indaw were washed away by floods. Two series of experiments were also conducted at Gyodaung and Kawlin in the Katha District by the Senior Agricultural Assistant, Shwebo North, Kanbalu, with varying rates of 70 lbs., 80 lbs., 90 lbs. and 100 lbs. per acre of Nicifos 2. Ammonium Sulphate at 100 lbs. per acre and Nicifos 2 at the same rate were also tried at Kawlin.

It has been found out that the fertilisers do not prevent the attack of the disease. The details of the experiment may be referred to the report of the Entomologist, Burma, for the year.

C30-28 strain of paddy at Kayagon and C30-24 strain of paddy at Kya-in, Kawlin Township, Katha District, were tried in the hope of finding a variety in them that will resist the " Onion Leaf Disease ", but it is reported to have been attacked by the disease as equally bad or even worse than the local varieties.

4. *Paddy Variety Trials at Ye-U.*—Economic Botanist, Burma's selected *Ngasauk* and C28-16 (Tenasserim Circle) have done well.

These strains and the strains under distribution will be tested against local strains in collaboration with the Economic Botanist, Burma, next year.

Pests and Diseases.

(a) *Ngamvaungdaung* on paddy nurseries in the Mandalay and Shwebo Districts was prevalent. The attack was less severe in nurseries which had been dressed with fertilisers and in nurseries which had been top-dressed. The disease was checked to a great extent by the timely advice of the District Assistants.

(b) *Ywetpo* on paddy was found in Shwebo South. The disease appeared three weeks after transplanting but the attack was not serious.

(c) *Myitpo*—This so-called *Myitpo* disease was found to attack very little this year and is believed by the cultivators to be the affect of good and early rains for paddy.

(d) *Stem borer* on *Wagale* and Cambodia cottons was found to be serious in the Mandalay District. The Entomologist, Burma, has been invited to attend to the matter.

(e) *Rust on wheat in Sagaing District was so serious that* attention had to be paid for due remission on land revenue.

(f) *Onion Leaf Disease*, on paddy was extensive in the Myitkyina and Katha Districts. The yeild of paddy was much reduced. The disease is known to be most prevalent in low-lying and water-logged areas and is caused by an attack on the stem by the paddy stem gall fly. The stem then developes into a shoot which resembles an onion leaf, hence the name. The formation of this shoot prevents the production of ears and of course reduction of yield is inevitable.

(g) *Brown Leap Spot* (Tikka Disease) on Spanish groundnut on "Kaing" lands in the Mandalay District was noticed in mild form.

(h) *Tauk-te-me* disease on onion was fairly widely distributed in almost every onion growing tract in a milder form than in the previous years.

(i) *Mildew* in betel vines was very serious at Kyauksè. Sulphur dusting was found satisfactory. The root rot of betel vines usually present at Kume was not noticed this year.

(j) *Field Rats* damaged standing paddies in October and November 1938 in Thamindwin, Kanbya, Wathondaya and Pinya *Kwins* in Mandalay District. Use of Cyanogus Pump was demonstrated at four places with success.

(k) *Crickets* and Caterpillars attacked very seriously on *kaing* crops such as tobacco and chillies in Zigôn, Kyingyi and The-in in the Mandalay District. These were noticed very late in the season.

Demonstration and Propaganda.

Twenty-one (13) demonstration charges were organized during the year. Nine hundred and seven (262) demonstration of implements, methods of cultivation, varietals and manurials were carried out affecting 877·66 (244·22) acres.

The following table shows the distribution of demonstration charges :—

Charge. (1)	Demonstrators' Headquarters. (2)	No. of Temporary Demonstrators. (3)	Demonstrations. No. of holdings. (4)	Demonstrations. Area in acres. (5)	Remarks. (6)
Mandalay South	Mandalay ...	One	102	59·20	Whole year.
Mandalay North	Yenatha ...	One	102	41·30	Do.
	Mandalay ...	One			
Kyauksè ...	Singaing ...	One	174	151·72	Fieldman. Whole year.
		One			Whole year.
	Myittha ...	One			Fieldman. Whole year.
		One			Whole year.
Sagaing ...	Padu ...	One	127	229·40	Fieldman. Whole year.
	Sagaing ...	One			Do.
	Paukkan ...	One			Whole year.
Shwebo South	Shwebo ...	One	153	179·08	Fieldman. Whole year
		One			Whole year.
		One			Six months
Shwebo West ...	Ye-U ...	One	129	138·60	Fieldman. Whole year.
		One			Ten months.
		One			Five months.
Shwebo North	Kanbalu	One	53	29·69	Whole year.
		One			Five months.
Myitkyina ...	Mohnyin .	One	67	48·67	Fieldman. Whole year.
	Do. ..	One			Whole year.
	Myitkyina ...	One			Do.
	Total ...	21	907	[illegible]7·66	

In addition 440 manure pits (5 in Mandalay South, 70 in Kyauksè and 365 in Shwebo South) were also demonstrated.

Details of demonstrations carried out during the year are given in the following table :—

Kind of demonstrations.	Number.	Area of demonstrations in acres.
Varietal	106	113·04
Manurial	190	58·63
Theikpan ploughs	151	179·00
Intercultivators	101	130·54
Seed Drills	10	19·75
Line or Square sowing of crops ...	169	147·64
Anti erosion lay-out	2	11·75
Multiple cropping	115	186·30
Miscellaneous	63	31·01
Total ...	907	877·66

Trial Cultivation of New and Improved Crops.

Paddy.

C30-28 and C30-24 tried at Kayagon and Kya-in in Shwebo North were attacked by the "*Onion Leaf Disease.*" In Mandalay South these strains gave very good yields of 68 baskets and 70 baskets per acre respectively.

Sil-pwa (Deep Water Paddy) tried at Shin-hla in Mandalay North fared well. At Mondaw in Mandalay South the yield was 18 baskets per acre, but the condition at that place was not typical for this paddy. At Ngalonbo in Kyauksè District the yield was 46 baskets per acre.

Ngayunwabo tried in three places in Shwebo South yielded better than the selected *Ngayunwa 8*, but the grains being bolder was not much liked.

Mwesws tried at Namma and Namti in the Myitkyina District gave a good average yield of 36 baskets per acre.

Hkawbashi and Okshit tried at Namma, Myitkyina District, gave good average yields of 40 baskets and 36½ baskets respectively.

Other Crops.

Wheat tried at Mawhan and Okkyin, Myitkyina District, gave yields of 12½ baskets and 21 baskets per acre respectively.

Karachi Gram tried as single crop in Mandalay North and South gave an average yield of 15 baskets per acre. As a second crop after paddy in many charges of the Circle it did well and gave an average yield of 8 baskets per acre.

Spanish Groundnut mixed with *pesinngon* tried at Kabaing and Yedwet in Mandalay South did well. Because of drought in the month of July the yield of nut was only 12 baskets per acre. The yield of *pesinngon* was 10 baskets per acre.

Pegya sown in lines at Sagadaung, Mandalay North, gave a good yield of 30 baskets per acre as against 11 baskets per acre broadcasted.

Pegyi in lines and intercultivated gave a good yield of 15 baskets per acre in Mandalay South.

Sesamum (Thadunbyu) sown in lines at Kinywa in Mandalay North and at Yegyi and Kinbet in Mandalay South gave a fair average yield of 6 baskets per acre. In Myitkyina it was not successful because of severe rainfall.

Ramkel Jower tried in Shwebo South, Mandalay South and Kyauksè District did well. Because the rainfall was good nothing could be said of its drought resistant quality.

Linseed tried at five places in Shwebo South in the standing paddy as a second crop was successful.

Cotton sown in lines at Hnan-gyi, Hmaubin and Sinbok in Mandalay South did well, but they were attacked by stem borers.

Hickory King Maize tried at Payegyun and Shangalekyun did very well.

New Era Cow Pea tried at five places in " Kon " lands and at two places in " Kyun " lands in Mandalay South did well. Better yield is obtained from "Kyun" lands. At Kan-hla, Myitkyina District, the yield was 9 baskets per acre.

Onion tried in the river bed at Kabo, Shwebo North, had done well.

Kew Pineapple suckers planted at Wuntho, Shwebo North, are growing very well.

Sugarcane.—Wet Planting was conducted at Htonbo in Mandalay South and in 27 places in Kyauksè District. The germination in all cases was very satisfactory.

SEEDS AND IMPLEMENT DISTRIBUTION.

The following statement will show the total distribution of various improved seeds through the agency of the Department during the year charge by charge in baskets and in pounds as well :—

No.	Name of seeds.	Weight per basket in lbs.	Mandalay South.	Mandalay North.	Kyauksè.	Shwebo South.	Shwebo West.	Shwebo North.	Myitkyina.	Sagaing Township.	Total. In bkts.	Total. In pounds.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	Paddy	50	6,594	7,165	12,574	27,690	4,730	779	61	...	59,593	2,979,650
2	Cotton	18½	14	...	...	...	...	...	...	...	14	90
3	Spanish Groundnut ...	25	...	151	12	50	124	49	59	147	592	14,480
4	Sesamum	54	...	2½	...	...	...	12½	6½	7	28½	1,539
5	Peas and Beans ...	70	...	45	3	...	46	55	...	...	155	10,850
6	Karachi Gram ...	70	...	6	165	130	71	1½	...	374½	748	52,360
7	Wheat	70	...	...	...	70	...	3½	55	142½	271	18,970
8	Millet	70	...	...	...	6	...	30	...	...	36	2,520
9	Sugarcane	...	...	...	...	...	...	...	...	...	...	...
10	Miscellaneous Seeds ...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	...	6,608	7,369½	12,754	27,946	4,931	921½	236½	671	61,437½	3,080,459

The following seeds and implements were distributed in addition to above :—

1. Seeds, Fruit Trees, Grafts and Suckers—(Distribution) :—

(*a*) Onion seeds	... ...	6 *pyis.*
(*b*) Shallot and Garlic	... ...	200 viss
(*c*) Lichi Grafts	... ...	18 plants.
(*d*) Rambuton Grafts	... ...	18 "

2. Implements—(Distribution) :—

Charge. (1)	Plough bodies. (2)	Theikpan plough-share. (3)	B.T.S.L. Cultivators. (4)	Gwinsets. (5)	Total. (6)
Mandalay South ...	...	12	1	...	13
Mandalay North ...	...	22	...	...	22
Kyauksè	...	118	1	...	119
Sagaing	...	75	...	...	75
Shwebo South ...	...	139	9	...	148
Shwebo West ...	7	427	...	1	435
Shwebo North ...	...	383	2 and 15 points.	...	400
Myitkyina	...	65	...	...	65
Total ...	7	1,241	28	1	1,277

NOTE.—The local smith U Po Lu of the Union Engineers Works, Mandalay, continued to manufacture Theikpan plough shares under the brand of "N.C." and Numbers "0, 1 and 2" according to sizes. The quality and finish of these shares have been improved.

The price of a B.T.S.L. Cultivator had been reduced to Rs. 23 and yet it was considered high. A few of these still remained in stock to be disposed of.

3. Artificial Fertilisers—(Distribution) :—

		lbs.
(*a*) Sulphate of Ammonia	... ...	1,024
(*b*) Nicifos 1	... ...	224
(*c*) Nicifos 2	... ...	320
	Total ...	1, 68

SEEDS.

Seed Farms.—The most important crop is paddy for the irrigated areas in Kyauksè, Mandalay and Shwebo Districts. *Taungdeikpan* for Mandalay, Kyaukse and Shwebo Districts ; *Ngasein* and *Shweat* for Mandalay and Kyauksè Districts ; and *Ngayunma* for Shwebo District. The purity of these seeds is maintained at all the Government Seed Farms from where seeds are supplied to all the Private Seed Farms at which places they are multiplied under Departmental supervision and

distributed to neighbouring cultivators. Government and Private Seed Farms in the Circle are listed below :—

(i) *Government Seed Farms.*

No.	Name of Seed Farm.	Charge.	Area worked.	Kind.	Produce of 1938-39 reserved for distribution.	Seed distributed in 1938-39.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Acres.		Bkts.	Bkts.
1	Agricultural College Estate, Mandalay.	Mandalay South.	247·79	Paddy	6,291	5,935
2	Singaing Major Seed Farm, Singaing.	Kyauksè	92·66	Do.	2,709	2,097
3	Myittha Minor Seed Farm, Myittha.	Do.	29·33	Do.	1,002	678
4	Chiba Major Seed Farm, Shwebo.	Shwebo South.	79·95	Do.	3,255	2,792
5	Kanbalu Central Farm, Kanbalu.	Shwebo North.	25·74	Do.	501	768
6	Ye-U Major Seed Farm, Ye-U.	Shwebo West.	45·65	Do	1,056	662
7	Mohnyin Major Seed Farm, Mohnyin.	Myitkyina	50·39	Do.	1,007¾	...
8	Padu Major Seed Farm, Padu.	Sagaing Township.	92·35	This farm is for wheat, gram, cotton, Spanish *groundnuts*, *sesamum*, jowar, etc. No distribution of any seed was made during the year.		
		Total ...	661·86	...	15,821¾	12,932 *

* 646,600 lbs.

N.B.—As the Mohnyin Seed Farm was opened during the year there was no seed distribution. The produce will be distributed next year.

Private Seed Farms.

Charge.	Private Seed Farm.		Produce during the year in baskets.	Distributed last year in baskets.
	No.	Area.		
(1)	(2)	(3)	(4)	(5)
Kyauksè	46	587	16,740	8,210
Mandalay South	22	261	9,575	4,329
Mandalay North	23	580	26,475	5,019
Shwebo South	55	1474	37,108	24,868
Shwebo North	7	125	4,510	266
Shwebo West	69	1491	25,084	3,969
Myitkyina	...	...	...	...
Sagaing Township	...	...	...	...
Total ...	222	4518	1,19,492	46,661*

* 23,33,050 lbs.

Area under improved seeds.—The chief crop is paddy and it has reached the saturated condition in Mandalay, Shwebo and Kyauksè irrigated areas. The area under Karachi gram and Spanish groundnuts has again increased by about 9,000 and 6,000 acres respectively over that of last year. Six hundred acres have been increased under *pèsinngon*. The areas under improved seeds are given in the following table :—

Area in acres under Improved Crops.

No. (1)	Kind of seed. (2)	Kyaukse. (3)	Mandalay South. (4)	Mandalay North. (5)	Shwebo South. (6)	Shwebo North. (7)	Shwebo West. (8)	Myitkyina. (9)	Sagaing. (10)	Total. (11)
1	Paddies	1,04,659	49,679	36,775	1,02,500	10,639	18,215	373	...	322,840
2	Karachi Gram	17,165	3,021	1,207	9,650	...	2,071	...	10,000	43,114
3	Wheat	1,050	...	...	150	...	274	55	10,500	12,029
4	Spanish Groundnut	4	150	12,075	9,000	1,820	900	19	2,000	25,968
5	Peas and Beans	911	1,536	210	...	520	24	72	...	3,273
6	Sesamum	3,300	...	...	...	3,880	...	18	...	7,198
7	*Pesinngon*	450	15	32	800	52	150	...	7,000	8,499
8	Cotton	10	255	121	...	...	...	...	200	586
9	Saccoline	3,500	...	70	340	40	10	...	...	3,960
10	Sugarcane	1,180	72	...	137	...	...	7,126	...	8,515
	Total ...	1,32,229	54,728	50,490	1,22,577	16,951	21,644	7,663	29,700	435,982

PUBLICATION.

No bulletins or leaflets were complied and printed for publication.

SEED AND IMPLEMENT ADVANCE AND LOANS TO CULTIVATORS.

(*a*) The advance was Rs. 25,000 and the allotment Rs. 25,000 for the year in the Seed and Implement Advance. The accounts began with Rs. 14,568-8 as value of stock in hand and Rs. 5,354-1-6 as outstanding. A total sum of Rs. 20,000-11 was withdrawn from various treasuries for purchase of seeds, implements and manures, and a total sum of Rs. 20,877-7 was credited. The year closed with Rs. 16,151-1 as value of stock in hand and Rs. 4,943-3-6 as outstanding. The year's transaction resulted in a profit of Rs. 2,050-12 and a loss of Rs. 2-5 leaving a nett profit of Rs. 2,048-7.

(*b*) A sum of Rs. 1,035 was issued to the tenants of Government seed *farms through the recommendations of their respective district agricul*tural officers from the Agriculturist's Loans Allotment. The following is the table :—

No. (1)	Departmental Seed Farms. (2)	No. of tenants. (3)	Loans given. (4)
			Rs
1	Chiba Major Seed Farm ...	Six ...	300
2	Singaing Major Seed Farm ...	Eight ..	390
3	Ye-U Major Seed Farm ...	Four ...	200
4	Myittha Minor Seed Farm ...	One ...	145
	Total ...	...	1,035

In addition to above a sum of Rs. 200 was issued under Agriculturist's Loans to U Thaung, Letwezu, Singaing Township, Kyauksè District, for constructing a sugarcane furnace.

MISCELLANEOUS.

The District Staff and the Office Staff have worked well during the year under report.

BA MAUNG,
Deputy Director of Agriculture,
Northern Circle, Mandalay.

Annual Administration Report of the Myingyan Circle for the year ended the 31st March 1939.

1. ADMINISTRATION (STAFF).

The Myingyan Circle comprises the five administrative districts, Meiktila, Myingyan, Sagaing (except Sagaing Township), Lower Chindwin, and Upper Chindwin lying in the Dry-Zone of Upper Burma, but work at present is confined to the first four.

Mr. H. F. Robertson, I.A.S., was in charge almost throughout the year up to the 27th March 1939 when he was relieved on his transfer by U Saw Tun, B.A.S., Class I. U Saw Tun, B.A.S., Class II, was Assistant Director of Agriculture until he was promoted to Class I and transferred on the 19th May 1938, when Senior Agricultural Assistant U Ba On (2) took over charge of these duties.

Mr. H. F. Robertson was on tour for 257 days, U Saw Tun for 17 days and U Ba On (2) for 79 days.

The year saw some changes in staff unfortunately leading to reduction which further accentuated the shortage of staff previously referred to. On the promotion and transfer of Assistant Director of Agriculture U Saw Tun, Senior Agricultural Assistant U Ba On (2) took his place and handed over charge of Meiktila West district work to Senior Agricultural Assistant U Tha Lu who was doing preparatory work in connection with the proposed Cotton Seed Farm in the Meiktila Fuel Reserve (now known as Thapan Cotton Seed Farm). During the ginning season Junior Agricultural Assistant Mr. E. B. Minus in charge Myingyan South was temporarily transferred to Malhaing Farm. At the end of the ginning season in February 1939, Assistant Director of Agriculture U Ba On (2) took over charge of Meiktila West district work in addition to his own duties and Senior Agricultural Assistant U Tha Lu was transferred to Meiktila for work on the Thapan Cotton Seed Farm.

During the year the various charges were held as under :—

Mahlaing Farm.—Farm Superintendent, Senior Agricultural Assistant U Hla Tun.

Farm School and Plant Breeding, Senior Agricultural Assistant U Chan Nyein.

District Work.

Charge	Headquarters.	Officer-in-Charge.
Meiktila East ..	Meiktila ...	Junior Agricultural Assistant U Po Ngai.
Meiktila West ...	Mahlaing ...	Senior Agricultural Assistant U Ba On (2) from 1st April 1938 to 15th May 1938. Senior Agricultural Assistant U Tha Lu from 16th May 1938 to 26th January 1939. Assistant Director of Agriculture U Ba On (2) from 27th January 1939 to the end of the year.
Myingyan South	Taungtha ...	Junior Agricultural Assistant Mr E. B. Minus. (Also at Mahlaing for ginnery from 3rd October 1938 to 3rd February 1939.)

Charge	Headquarters.	Officer-in-Charge.
Myingyan North (including part of Sagaing.	Myingyan ...	Senior Agricultural Assistant U Shein Maung.
Myinmu (Sagaing) and Kyehmon Seed Farm.	Myinmu ...	Senior Agricultural Assistant U Ba Thein (3).
Lower Chindwin	Mônywa ...	Junior Agricultural Assistant U Pan Lwin.

None of the staff took leave during the year.

2. Character of Season.

A fairly good agricultural season, less favourable for cotton, was marred by poor prices in most cases.

Speaking generally of the Dry-Zone the total rainfall for the year was about average or just under but the distribution was as usual faulty. The outstanding feature of the season was a long period of drought from June through July to August which adversely affected early rain crops such as cotton, sesamum and groundnuts. *Pèsinngon* in line-sown cotton appeared to come through the drought better than any other crop. The sowing rains for cotton were timely and plentiful but in the north-west of the Circle there was no second sowing rain and some cotton remained unsown. Cotton sowing was also hampered by unusually bad seed and ridiculously high seed prices near sowing time. Middle and late rains and crops were good with a very useful fall towards the middle of November. But cotton, especially in the north-west, suffered from a spell of heavy and continuous rain during the picking season. Thus the cotton crop was greatly reduced from the previous years and the yield of groundnuts was also low. *Pèsinngon* promised very well but was attacked very severely by " Pothe " except in the case of resistant varieties.

Unfortunately the economic situation again deteriorated. Cotton opened the season very weak at about Rs. 13 per 100 viss but probably most of the crop was marketed between Rs. 15—20 as the market improved until the first week of 1939 when it experienced further weakness. Ginneries generally reported poorer outturns and, particularly in the north-west, a lot of leaf and *kywe* and with a much reduced crop and difficult market had a poor season. The groundnut market also opened very weak but improved. Sesamum was low and the price for beans has gone to rubbish levels. *Pèsinngon* was a stand-by and also gram.

It is therefore again obvious that no improvement took place in the general econmic condition of the cultivators, rather it deteriorated further.

Cotton showed a considerable reduction in area from the peak level of last year but groundnut remained almost the same. *Pèsinngon* was very prominent.

3. Agricultural Education.

This takes various forms, and though the chief feature is the Farm School at Mahlaing Central Farm, the visit of cultivators to that Farm in the shape of a Farmers' Short Course played a very prominent part for the second year.

Mahlaing Farm School.—This completed another very useful and successful year's work. The course is an annual one extending over the nine most important (agriculturally) months of the year, April to Janaury, and is designed to emphasise the practical side of agriculture while giving enlightenment on the underlying processes. It includes a short course on veterinary subjects given by an officer of the Veterinary Department. The number of scholarships offered was increased from 12 to 14. Seventy-two selected applications were received and, in making the final selection, preference was given to those places where our work is new. The standard of educational qualifications was maintained though, of course, in selection chief importance is placed on the applicants' qualifications and possibilities as a practical farmer, and all those selected were sons or relatives of enterprising cultivators and already proficient in ordinary cultivation practices. The monthly stipend paid was Rs 14. Unfortunately of those first selected no less than three dropped out owing to sickness and for domestic reasons and three substitutes had to be appointed. This seemed to cause some deterioration and the general standard was not up to that of last year. The ages of the students ranged from 20 to 26 years, most of them being between 20 and 23 years.

As two students left before the expiry of the course only 12 took the final examination, practical and theoretical, given orally. All passed, there being only one distinction this year. The quality of the work done was not of as high a standard as in the previous year. Of the passed students three have been given employment as permanent labourers on Government Farm which will give them further valuable training, and the remainder have all returned to their houses to follow an agricultural occupation.

The good new feature in the training given of sending out some of the students as extra sowing men at sowing time for district work was continued, and in this way 425 acres cotton and 200 acres beans, were line-sown.

Visit to Mahlaing Farm.—For the second time the sanction obtained to the employment of funds under "33 C. Agricultural Experiments" for the purpose of bringing Demonstration Holding Owners and other progressive and interested cultivators, especially from new tracts, to Mahlaing Farm and other centres of demonstration and entertaining them while there was exercised. Full use of the opportunity was taken and a sum of Rs. 471 was spent on a *Farmers' Short Course* of two days at Mahlaing, which 105 cultivators from 80 villages in the four districts of Meiktila, Myingyan, Sagaing and Lower Chindwin attended. On the first day, the morning was occupied by going over the farm and implements in small conducted parties and the afternoon in lectures. On the second day, a visit was paid in the morning to a village where much progress has been made, and this was followed by an open discussion in the afternoon. Of the happy relations obtaining, it may be mentioned that our followers in the village in question provided carts and refreshments of their own free will and the visitors were very much impressed by the improved financial standing of the cultivators and the efficient storage of Farm Yard Manure and consequent cleanliness of the village. On all sides this new course was counted a very great success and, later, on tour in the villages, it was heartening to find what a great impression had been made both this year and last and how much good had been done.

No Government money was ever spent to better advantage and it is intended to make it a permanent feature.

One hundred and eighty-one cultivators from Meiktila and Myingyan Districts attended a meeting of improved cotton growers held in September, and were entertained to breakfast and tea by the staff. Besides cotton business, the opportunity was taken to discuss and demonstrate improved methods, and the Deputy Director of Veterinary Services, Upper Burma Charge, addressed the meeting on cattle breeding and disease and a Co-operative officer on co-operation. A second meeting to be held in March had to be cancelled owing to an epidemic of plague.

Fifty four attended the annual gathering of old students of the Farm School, and they came from all over the Circle, as it was found possible this year to assist in paying travelling expenses from the more distant parts.

4. Agricultural Research.

A complete account of the experimental work of the Circle is given in the Mahlaing Farm Report for the year and the work is only briefly summarized here.

Cotton.—The improved selected strain No. 3 completely replaced No. 2 on the Central Farm area of 80·61 acres and in the first year outside and also partly in the second year. Outside there were 5,605 (4,328) acres under No. 2 and No. 3. Although the season was generally less favourable than the previous one the average yield on the farm was more than maintained at 585·32 (500) lbs. seed cotton per acre, the final Cotton Forecast for Meiktila District being 163 (211) lbs. per acre. This was helped by the policy of manuring. The ginning outturn of No. 3 at 39·80 per cent (39·32 per cent) was satisfactory. In addition, selfed seed of No. 4 was multiplied in isolation on 6·29 (2) acres of better class farm soil yielding 873·97 (1,227) lbs. per acre, and last year's No. 4 seed was multiplied by two selected growers at Kyundaung No. 3 seed was also multiplied on Kyehmon Farm and in the Maletha Tract.

The 49 bales of No. 3 and 29 bales of No. 4 sent to the United Kingdom realized a good premium and this year 280 bales and 57 bales respectively have been sent and the result is that No. 3 growers have been paid Rs. 24-13-3 per 100 viss of kapas as against under Rs 20 for ordinary cotton. The main points of the report from the Shirley Institute, Manchester, are repeated below for information :—

	No. 3.	*No. 4.*
Actual Count	25·0	24·1
Breaking Test or Lea Strength ...	58·9 lbs.	7[illegible]·7 lbs.
Highest Standard Count	26	32
Effective Length of Staple	31"/32	32"/32
Mean Length of Staple	25"/32	26"/32

No. 3 is a good weft cotton and has very good colour while No. 4 is a strong warp cotton.

Tests conducted at the Technological Laboratory, Bombay, confirmed the above report and also brought out the superiority of Nos. 3 and 4 to the other two new hybrid strains, *viz.* (S × W) × Dh_2 and Rosea × (S × W) in staple and spinning performance.

The double varietal test on upland and lowland was continued, but results were very much upset by the season and erosion', though No. 4 still maintained its high yield. The new hybrid (S × W) × Dh_2 referred to in the last year's report gave good yields in both the tests and its inclusion in the Field Varietal Test will be continued.

In the Plant Breeding Section, a strain test showed this new hybrid (S × W) × Dh_2 to be promising again. A total of 2,140 plants belonging to 7 hybrid strains in the F_{10} generation, 16 in the F_5, 17 in the F_4, 32 in the F_3, 5 in the F_2 and 5 plants in the F_1 were self fertilized and studied with a view to further selection. Further lines of No. 3 and No. 4 and indigenous strains brought the total selfed to 3,700 plants. In the selection work Hutchinson and Panse's method of replication and randomization of progeny rows was employed for the first time with F_{10} and F_5 hybrids and will be used in future. Some new crosses were made. A further trial of recent Indian selections was made without anything of promise showing, but this will be repeated.

Among the F_5 hybrids a few strains which were crosses between No. 3 and No. 4 with (S × W)W_4 were found very promising, and graded by the Master Spinner of the Spinning Mill, Myingyan, as equal to Uganda and superior to American Uplands.

In addition, selection of Cambodia was carried on, the growing and recording of the plants being done at Kyehmon and the laboratory tests at Mahlaing. Seven plants (five from the local variety and two from Coimbatore CO_2) were selected and put down in rows for record and selling.

Manurial.—The qualitative fertilizer test with cotton showed the need of the soil for Nitrogenous manuring in the form of sulphate and it remains to decide economically whether the extra cost of Nicifos No. 2 over Ammonium Sulphate is warranted or not.

The Permanent Manurial Series in rotation was under early sesamum followed by beans and both showed very handsome increases from the applications of Farm Yard Manure. Green manure however depressed the yield of sesamum during the year due probably to the season.

Early sesamum.—In continuation of the work started three years ago more work was done on this crop. Seven varieties were under selection and an eighth was added. A strain test and a field varietal test showed some of the new varieties to be superior to the standard "Gwagale".

Pesinngon.—Again a lot of work was done on this crop. In addition to 75 lines under selection by the Economic Botanist being grown on 5·50 acres of the farm, selection was carried out on seven varieties including the "Pothe" free "Shwedinga"; Pusa 51 was under trial and during the course of the year a likely variety was brought in from Kyaukoh. A strain test again showed New Era to be the lowest yielder with Mahlaing Green Pods at the top. C_{10} and "Kyehmon 4" gave equal yields but as the latter possesses bolder seeds with lighter colour it will be tested on a field scale on the Mahlaing and Kyehmon Farms.

Striga Lutea on "Pyaung".—Six varieties including the farm "Kalapyaung" which showed resistance to Striga lutea last year were

put under selection. All were again found to be very resistant and selection work will be continued with them.

Beans.—Increased work on Butter Beans was continued, and of the seven varieties and five hydrids which were under selection a few showed promise as regards yield and quality. A varietal test showed again Moki-Lima 27—30 to be inferior in yield to Sieva Pole. This also applied to the new strain Moki-Lima 32—40. On rather poor soil "Pegya" as usual did best.

Small trials were also made of some other beans, and Soya bean Kwangsi and Kedalee 16 (black seeded varieties) grown in the late rains did fairly well. Work was begun on Myingyan "Pedisein" and continued on "Pegyi".

Linseed.—Further trials did well this year and the unselected variety from the Central Provinces yielded five baskets per acre. Of nine new strains tried, H-68 and H-21 seemed promising.

Line-sowing and Seed-drills for Cotton.—Two types of seed-drill evolved last year were used successfully on a field scale. "Legwetkya" method of sowing was practised with very satisfactory results on better class land but more experience in sowing seemed necessary to make it an unqualified success.

Farm Yard Manure and Compost Making.—Methods of using up all farm wastes were again carried out with good results.

Poultry.—Pens of White Leghorns and Barred Plymouth Rocks were maintained.

5. Pests and Diseases.

On cotton, boll insects, "Byaing-chi", and aphis were much as usual while the Stem Weevil (*Pempheres affinis*) was widely prevalent. The latter seemed to attack earlier this year and, perhaps on account of the long drought, there were more actual deaths amongst the cotton plants. The position was under study by the Entomological staff who had replicated tests on Mahlaing Farm. Wilt was not so prominent.

The most prevalent and damaging disease observed during the year was "Pothe" on *Pèsinngon* which took heavy toll from a very promising crop where non-resistant varieties were grown. Better conditions seem to help to reduce this disease but the real method of prevention is to grow a resistant variety and fortunately such are to be found. As a start "Shwedinga" with rounded leaves appears to be totally resistant and it is being rapidly spread. New Era also appears to be resistant. Cultivators believe that liability to this disease developes with continued growth of *pèsinngon* on the same land.

Striga lutea and smut were prevalent on "Pyaung" during the year but incidence of the latter has now been noticeably reduced in the main "Sanpyaung" tracts as a result of the campaign over the past five years for use of Copper Sulphate. The figures are 3,646 (2,662), (1,548), (1,462) (901) packets sold and in addition there is now a large sale of Copper Sulphate from the bazaars for this purpose. Nine hundred and sixty packets Agrosan G (equivalent to double the number of Copper Sulphate packets) were also given out on trial but no advantage, beyond the fact that the seed is not wet, was observed. On the other hand no practical control measures have been found for Striga lutea but a resistant variety "Kalapyaung" has been found and spread to some extent and is also under selection. It is a vigorous grower and the fodder is of good quality but at present the stalks are hard and the grain of low eating quality.

"Pothe" was common on sesamum and "Tikka" disease was found on Spanish Erect Groundnuts on the "Kyun," but usually coincided with maturity and did not seem to do much damage.

6. DEMONSTRATION AND PROPAGANDA.

The main features are Demonstration Holdings and Seed and Implement Distribution, and the work is very much concentrated and restricted to special areas. During the year three Senior Agricultural Assistants and three Junior Agricultural Assistants were engaged on the work out of a total staff of eight. In addition there were 30 Demonstrators employed and 134 extra men at sowing times.

Demonstration Holdings.—A special feature of the work in this circle is the grant from the Cotton Cess Fund of the Government of Burma, which is devoted to general agricultural improvements in the cotton tracts of the Dry-Zone. During the year a grant of Rs. 11,000 was received. With some assistance from the Budget allotment of Rs. 1,500 (1,490) under "33C. Agricultural Experiments", this enabled the employing of 30 Demonstrators and the working of 30 (31) centres with 87 (87) Demonstration Holdings. The previous Table 1 giving details of these has been omitted for economy of space. In addition there were 217 demonstration plots of line-sown cotton and many of other items as in Table 1 below:—

TABLE I.

Ser. No.	Charge.	No. of Demonstration Holdings worked.	No. of Demonstration line-sown plots.			No. of Demonstrations.				Remarks.
			Cotton.	Other crops.	"Pèsinn-gon."	Ploughing.	Intercultivation.	Copper Sulphate or Agrosan.	Miscellaneous.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	Meiktila East ...	21	43	5	21	37	37	15	...	
2	Meiktila West ...	17	27	12	11	34	57	60	...	
3	Myingyan South ...	13	18	15	6	25	38	80	5	Pineapple.
4	Myingyan North ...	14	30	10	14	28	56	65	...	
5	*Sagaing*	11	46	32	26	87	99	30	...	
6	Lower Chindwin ...	11	53	43	30	69	90	65	...	
		87	217	117	108	280	377	315	5	

The object of the work on these Demonstration Holdings is to effect a general improvement in the standard of agriculture in the Dry-Zone, particularly amongst cotton growers, under the four main heads of (1) Line-sowing with inter-cultivation, (2) Anti-erosion lay-out of "Kazins," (3) Making and Storage of Farm Yard Manure, (4) Improved tillage with use of "*Theikpan*" ploughshares.

The disciplinary measures, changes, reorganization, and extension into new areas, carried out as a result of past experience were found to have been productive, or to be promising of good results in most cases. The demonstrators on the whole have worked better, better holders have been found, and contact has been made with keener and more progressive people. This is reflected in the results obtained. Still, however, it was found in the course of inspection this year that there were a few unsatisfactory holdings and Temporary Demonstrators and 12 of the former and one of the latter were changed. The changes or addition of Holdings were all made in the direction of keener people who in many cases were asking for us. In some of the newer parts there is still some suspicion to overcome and this is intensified where a new settlement is in progress as in Myingyan District. However, it can be truly said that in practically all places where we have been working within recent years, excellent relations of trust and friendship have been established with the cultivators, a point of first importance, and that the work of the Agricultural Department is one of the best influences for good in the countryside. The change in attitude is really remarkable and where we had to beg to be allowed to demonstrate we are now being begged to come and demonstrate. Moreover the financial condition of many hundreds of cultivators has been very substantially improved. Three years of our method seems to put a cultivator on his feet even in these years of low prices.

New ground was broken during the year in several places, *e.g.*, Yeyo in the Lower Chindwin District, Chaung-U and Ngazun-Gyo in Sagaing District, Shawbyu and Okpo in Myingyan District, Hlaingdet and Pindale in Meiktila District, and thirteen new Holdings were opened.

Plague took heavy toll of akyosaungs and followers during the year and disturbed the work to some extent.

Below are given some of the results obtained with the main items of improvement.

Line-sowing with inter-cultivation.—The very wide expansion in this item in connection with cotton, which has followed the change over to hand line-sowing methods instead of the Indian seed-drill in recent years, continued although handicapped in some cases by a reduction in the area of cotton worked, bad seed, lack of second sowing rain, and death of followers by plague. The total area of line-sowing for the

year is 82,200 (59,911) acres and of this cotton represents 35,953 (26,127) acres. The following shows the position charge by charge :—

AREA OF LINE-SOWN CROPS.

Charge.	Total in acres.		Cotton in acres.				Remarks
	1937-38.	1938-39.	1937-38.		1938-39.		
(1)	(2)	(3)	(4)		(5)		(6)
			Hand.	Drill.	Hand.	Drill.	
Meiktila East ...	*24,091*	*26,200*	*6,059*	*5,602*	*7,001*	*6,817*	
Meiktila West ...	11,552	20,659	4,333	185	7,625	386	
Myingyan South ...	14,277	17,173	4,316	274	6,071	156	
Myingyan North ...	2,646	5,974	935	253	1,750	121	
Myinmu (Sagaing) ...	2,540	4,147	972	317	1,621	443	
Lower Chindwin ...	4,805	8,047	2,881	...	3,962	...	
Total ...	*59,911*	*82,200*	*19,496*	*6,631*	*28,030*	*7,923*	

In the case of cotton, it is seen that the great progress made is practically all in hand line-sowing and that, while Meiktila District still provides the bulk of the area Meiktila West showing a very large increase, the other districts, which remained stagnant for years, are now forging rapidly ahead. For instance take the area of line-sown cotton in the Myingyan North, Myinmu and Lower Chindwin charges for the past four years.

AREA OF LINE-SOWN COTTON.

Charge. (1)	1935-36. (2)	1936-37. (3)	1937-38. (4)	1938-39. (5)	Remarks. (6)
Myinmu (Sagaing) ...	257	482	1,289	2,064	
Lower Chindwin ...	517	1,418	2,881	3,962	
Myingyan North ...	327	640	1,188	1,871	

In the case of the Myinmn and Lower Chindwin charges progress was specially hindered this year by the lack of second sowing rain, reduction in area, and bad seed. In Meiktila District the proportion of the cotton crop line-sown is now $\frac{1}{3}$—$\frac{1}{2}$. Further rapid progress is assured.

It can be very confidently stated that with the long drought experienced and the low prices prevailing, cotton line-sowers were particularly benefitted by increased resistance to drought and great saving in costs. And over a number of years there is no gainsaying the

financial improvement which line-sowing and other improvements have brought to many hundreds of cultivators. One keen cultivator working only one pair of bullocks and only 4—6 acres of cotton stated he had Rs. 1,000 surplus since he started five years ago, Rs. 500 of which he had spent on " ahlu " and the other Rs. 500 on buying land.

It is understood that the Myingyan Settlement Party found considerably higher yields on line-sown cotton fields.

With the adoption of the safe, sound, and easily carried out methods of hand line-sowing for cotton, together with other adaptations, all the objections of cultivators have now been met, except that of a little extra " dokkha " in that the cultivator has to drive the inter-cultivating implements with his bullocks instead of hiring labour to do hand weeding. This must be set against the great savings in costs and, in any case, does not count with the better and more energetic cultivators. That the objections have been successfully met is proved by the rapid increase in area and the fact that there are numerous villages where all cultivators are line-sowing all their cotton. It is even said that the new methods of line-sowing and treatment can withstand rain-beating better than broadcasting now. It is believed now that line-sowing will eventually become general.

During the year particular stress was placed on the " legwetgya " (square or rectangular) method of line-sowing for economy of seed, easy treatment, and high yield. This was especially so in the tracts where multiplication of improved cotton strains is being carried out. It has also great possibilities for the keen cultivator anywhere and will be pushed. For with good seed 3—5 viss per acre are sufficient and with increased drought resistance and much higher yield it is possible to reduce the area worked. Thus the amount of seed required could be provided conveniently from home-ginned seed and the troubles of bad and dear seed avoided. Again all expenses could be greatly lowered and the cultivator would be able to give proper attention and sufficient manure to all his cotton area. During the year a tendency to over-wide spacing and leaving too many plants per hole was noticed and advised against and this will be given further attention.

Following on last year line-sowing of cotton was again given special prominence and there were 217 (107) extra extension demonstration plots of this alone. A leaflet was also distributed. At Agricultural Shows, Festivals, etc., almost life size tableaux of line-sown cotton and inter-cultivation were staged with accompanying propaganda on costs, yield, etc.

At the same time the two new seed-drills devised, the " Two-way " and the " Kyandon " were given an extensive try-out with cotton both on the farm and in the districts and gave good results. The " Two-way " was found to withstand rain-beating very well and give a very even stand of plants and was also found suitable for sesamum. The " Kyandon " did well on sandy soils for which it was designed.

The other special implements which form part of the method are now dealt with under " 7. Implements."

An outstanding feature of the year was " pesinngon " in line-sown cotton either mixed with the cotton or sown in lines at regular intervals as advocated for better control, easier picking of cotton and late cultivation. This showed much progress and great financial benefit to the cultivators. Using an erect variety maturing much later than the cotton it has little effect on the yield of cotton and this year provided a

lot of much needed money. The "pesinngon" benefits greatly from the inter-cultivation given to the cotton and appeared to withstand drought and poor soils much better than cotton. It gives the cultivator a spread over both season and markets. The method is also advocated in groundnuts, sesamum, etc., and the total area this year was 9,850 acres. Rapid progress is expected.

Anti-Erosion Measures.—Anti-erosion measures for the prevention of soil wash and rain water run-off are of first importance in the Dry-Zone. The conservation of the land for cultivation is a problem of national mportance, and the conservation of soil fertility and soil moisture is a matter of great immediate importance to every "Ya" cultivator. It is no exaggeration to say that all over the Dry-Zone, and particularly in parts of Myingyan District, the top cultivable layer of soil is being visibly eaten away at a rapid rate. Land-owners in their own interests should pay much more attention to this.

For prevention of this the Agricultural Department demonstrates a lay-out of "kazins" on the land and Departmental Leaflet No. 81 has been printed and distributed widely. As a result there has been a wide awakening to the value of this item in recent years in several parts and much has been done, whole village-tracts being transformed in appearance. For the whole Circle the area on which anti-erosion "kazins" have been put is given by the assistants as 19,012 (14,138) acres but this only applies to those of which they have been able to keep a record in the immediate vicinity of their other work and the actual total area is very much larger. The bulk of this figure is in Meiktila District but the north of Myingyan District (Natogyi Township) has also shown a very large general extension in this item as has been found by the new Settlement Party and if this and other general expansion were included it is thought the total area would exceed 50,000 acres.

Farm Yard Manure.—For the maintenance of fertility in the Dry-Zone uplands this comes next after lay-out and is a first necessity. It would also be true to say that area which can be put under cotton is to a large extent limited by the quantity of Farm Yard Manure available. The Agricultural Department endeavours to demonstrate how a larger amount of better quality can be made with cattle and organic wastes as at present existing. This is achieved by employing all waste organic matters in a Box or Pen system of keeping the cattle with or without a pit as desired. Progress was slow but there has been great quickening recently and the figures for the year show 2,882 (1,851) improved Farm Yard Manure systems. Here again most are in Meiktila District but the others are now beginning to show progress, *e.g.*, Myingyan. But this is not the whole story and in addition to the figures given it is possible to report wide general progress in this item. It has been the practice in many villages to burn or dump in the jungle all wastes and refuse, *e.g.*, sesamum stalks, house compound refuse, etc., and the first improvement is to stop this and have them put into the breeding cattle pen or into the bullock box. This has been effected on quite a wide scale and 324 villages are now using wastes which formerly neglected them. It would also be quite simple for all villages to have a refuse pit just outside the village, instead of littering the entrance roadside with refuse as at present. The refuse would have a chance to rot and could be auctioned annually as manure on behalf of some local charity.

Theikpan Ploughshares.—This is given under "7. Implements."

Other Items.—The campaign for the use of Copper Sulphate for prevention of Smut on "Pyaung" again made a great step forward during the year and 3,646 (2,662) packets were sold. The treatment, being so simple, cheap and efficient, has become widely appreciated and, in addition to this sale by the Agricultural Department there is now a large sale of Copper Sulphate direct from the bazaars for this purpose. Unfortunately the correct proportions are not always followed, and a supply of pamphlets and posters giving instructions is being arranged for bazaar shops. Encouragement is given to "mixed farming" by advocating for those cultivators without breeding stock the rearing of young stock. This provides more Farm Yard Manure and a young pair can be used for the light work of inter-cultivation and eventually sold thus providing more income.

In the entire absence of other facilities for thrift reference was made in the previous years' reports to the use of the Post Office Savings Bank by cultivators. Unfortunately Post Offices with Savings Banks are very few and far between, not even all Township Headquarters having them. However, the making of savings by the cultivators against poor seasons and periods of poor prices, and for living and cultivation expenses from season to season, is regarded as essential to any general rural improvement and much to be preferred to easy credit. This year poor prices again were against progress in this item and though one or two accounts were increased the number of accounts was still low at 11 (9).

At Pegyet in Myinyan District collaboration was continued with Rural Uplift Work and the Youth Improvement Society there.

Agricultural Shows.—For the third year Agricultural Shows were to have been a noteworthy feature of the year's work and four were arranged at Mahlaing, Natogyi, Myinmu and Ayadaw, the latter being a new and first one. The funds provided by Government enabled a grant of Rs. 425 to be made to each show and it is very gratifying to be able to report that in every case public subscription made the sum up to well over Rs. 1,000, the minimum sum required, even numerous cultivators subscribing. It was found too that District Councils were more ready to subscribe this year.

Unfortunately for reasons not under control the programme of shows was completely upset. On account of plague Mahlaing was first postponed and then cancelled and Natogyi was cancelled and transferred to Taungtha. Then again Myinmu was spoiled by disturbances in the town and Ayadaw was cancelled by the Deputy Commissioner, Lower Chindwin, for fear of disturbances. Thus the only really successful show was that held at Taungtha, in Myingyan District, and it aroused great interest and attracted large crowds. Entries were also good in number and in quality for a first show. There is great keenness to continue.

The Departmental Stall was further improved with three tableaux of line-sowing and inter-cultivation methods and one of a model Farm Yard Manure Box.

In addition more attention was given to exhibits at Pagoda Festivals and 6 (3) Festivals were provided with exhibits, while a set of exhibits were provided for the Arts and Crafts Exhibition in Rangoon, and for several other circles.

Seed Distributions—1. *Cotton.*—Both No. 2 and No 3 were under distribution from Mahlaing Farm (the latter in course of replacing the former) and seed was given out for 5,605 (4,328) acres. 1,31,293·25 (1,09,257·25) viss *kapas* were ginned at the Mahlaing Farm Ginnery which included 90,611·0 viss No. 3 and the remainder consisted of second and third year No. 2. The ginning outturn was good at an average of 39·35 (37) and germination was much higher than previous year.

The reorganization of growers and the greater attention paid to cotton multiplication as mentioned last year has resulted in a very great improvement during the year for the rate of multiplication which was given as only about 2·5 times last year has already jumped to about 5·3 times in an inferior season. The seed rate was halved at about 10 viss per acre. Further improvement is expected on these figures with expansion of "legwetgya" sowing and better work. The purity of *kapas* was also improved.

Surplus No. 2 kapas was eagerly bought up by outside ginneries on account of its good ginning outturn.

On the Paleik Chord Railway Line No. 4 was further multiplied. This was in two lots. First the first year seed from Mahlaing 400 viss was multiplied by two selected growers at Kyundaung and produced 2,600 viss of seed with ginning outturn of 35·7 per cent and a multiplication rate of 6·5 times. Secondly the ordinary seed in its fifth year and 5,503 viss seed produced 7,800 viss seed with a ginning outturn of 34·68 per cent.

A new multiplication of No. 3 was started in the Maletha Tract behind Myinmu. Two thousand viss seed were sent from Mahlaing and half grown on Kyehmon Seed Farm and half by growers on the Maletha Tract. The season was a very poor one and multiplication was disappointing especially on Kyehmon Seed farm where the rate was only about 2—3 times. Outside was better at about 4—5 times. Ginning outturns at about 39 per cent were satisfactory but lint was very leafy. Rapid multiplication is expected in this tract as conditions are good.

There were altogether 570 Private Seed Farms in this Circle for improved cotton during the year.

To help in provision of seed of good germination and also in multiplication cultivators were encouraged to do home-ginning and also to arrange for special ginning with return of seed. There were 204 cases of the former and three of the latter during the year.

2. "*Pesinngon.*"—C_{16} continued to occupy a large proportion of the area under "*Pesinngon*" in the Lower Chindwin District but it suffered from "Pothe" and lower prices and its replacement is being considered. There was some increase in New Era particularly in Myingyan District but the outstanding feature of the year was the spread in the same district of the "Pothe" free "Shwedinga" variety which has also brought up the Myingyan price. A supply of mass selected seed of this has been arranged for coming season.

3. *Butter Beans.*—In the absence of a good export demand these were left to take chance, but they are to be found all over in an impure form. As there is a considerable premium now obtaining over "Pebyugale," steps are being taken for the coming season to distribute and multiply pure seed. The general position of the bean crop is very

unsatisfactory owing to continued low price, and to some extent "pesinngon" may be said to be taking their place.

4. *Spanish Erect Groundnuts.*—These continued their great expansion in the riverine tracts, and now cover a very large area and have been of very great benefit while prices for beans and tobacco have been low. Encouragement was given to the growing of these in adjacent "Ya" tracts for provision of seed for the "Kyun."

5. *Wheat.*—Wheat was encouraged during the year and 2,860 lbs. of Federation wheat were distributed in the Thazi Township. The crop did well, and will be pushed. Trials in other parts of the Circle were not successful probably due to season, but will be repeated.

6. *Onions.*—Growing onions for seed was encouraged during the year and met with a fair success in Meiktila Township. Good quality onions obtained from Messrs. Sutton & Sons, Calcutta, were tried in several places, but due to poor germination met with success only at one place, *i.e.*, Letthegyin in Taungtha Township.

7. *Other Crops.*—Seed of the Mahlaing selections of early sesamum and "pyaung" were sold from the farm while the late variety of sesamum "Hnan-ni" maintained its popularity in the Lower Chindwin and Sagaing Districts and has extended into Myingyan District.

8. *Seed Farms.*—Two new Cotton Seed Farms were acquired during the year, *viz.*, the Thapan Seed Farm of 4,433 acres from the Meiktila Fuel Reserve in Meiktila District and the Mingontaung Seed Farm of 380 acres from the Mingontaung Fuel Reserve in Myingyan District. *No funds have yet been provided for working these but a small* beginning was made with existing funds and staff.

The previous seed farms continued to be worked by tenants and *more striking progress was made in putting them to proper use.*

The Kyehmon Seed Farm was utilized for multiplying No. 3 cotton for the Maletha Tract of multiplication and also for a mass selection of Cambodia. Varieties of "pesinngon," Butter Beans, Spanish Erect Groundnuts, Sesamum and "pyaung" were also grown.

On the Myingyan Seed Farm cotton multiplication was given up as not being suitable and growing of cigarette tobacco was begun. "Shwedinga" and New Era "pesinngon" were grown and this farm should be unfit for multiplying "pesinngon" seed. Spanish Erect Groundnuts, Sesamum and "pyaung" were also grown.

Meiktila and Taungtha are only very small farms and not of much use at present but in a small way they were used for cotton, "pesinngon," groundnuts and sesamum. They *should be useful for multiplying* "pesinngon".

7. Implements.

As previously, the main lines of work were those implements connected with line-sowing methods mentioned under 6. Demonstration and Propaganda, and *Theikpan* Ploughshares.

In connection with line-sowing methods, the chief implement used is the Bullock Intercultivator for intercultivating between the lines. By means of a special arrangement these are now sold at the low price of Rs. 22 with payment in three instalments at harvests, the price having been reduced still further. There was a tremendous demand for them during the year, particularly in the Meiktila and Lower Chindwin Districts, and a total of 265 (238) were sold. More could have been sold but sale was restricted for fear of arrears in payments.

There are now 942 (680) in use in the Circle and, though a further large demand is anticipated, it is thought that sales may be on a slightly lesser scale owing to the low price of cotton and the use of other implements being taught. Low prices caused some lapses in payment of instalments. The "gyoke" attached to the rear side tines is becoming popular and a further extension of this is its use as a ground-nut harvester.

However, for the sake of poor people, and so that people would not think that line-sowing was advocated merely in order to sell inter-cultivators, special stress was placed during the year on the possibilities of treating line-sowing efficiently with cheap indigenous implements. With the use of the ordinary harrow for cross harrowing and as the "gwa-htun" (either 4 or 6 teeth or with two "gyokes") for inter-cultivation in the early stages, followed by the "gyoke," and in the later stages by the "htundogale", quite good work can be done. By regulating the spacing it is possible to make all these fit. The work of the "htundogale" is greatly improved by fitting the smallest Burmese shares to the teeth. Large areas are now worked in this way and even whole tracts of 500—600 acres of line-sown cotton are without a single Intercultivator, but of course the Intercultivator is preferred.

As mentioned previously, except in certain suitable localities, Indian Seed-drills are no longer of great importance with the change over to hand line-sowing methods for cotton, and in fact a large proportion of them are now used as line markers for hand sowing and the increase shown this year is really in markers and new type drills. The figures for the year show 1,672 (1,287) in use of which 21 (15) all new type were distributed departmentally. The two new seed-drills, the "kyandon" for fine soils and the "Two-way" for all conditions, were given extensive trials and proved very satisfactory. The "Two-way" proved very able to withstand rain-beating and is already being taken up by cultivators on their own.

Special stress was placed during the year on the use of the "gwa htun" and "gwa gyoke", doing two rows at a time, for cotton in the early stages. These are great time-saving implements and the "gwa gyoke" is likely to become largely used. A new design of "gyoke" to *avoid covering of young plants was put.*

Theikpan Ploughshares with their greatly reduced price referred to previously (and recently still further reduced) and extended demonstration, continued their great expansion amongst "Ya" cultivators. It is estimated that 5,401 (4,165) were sold during the year of which 4,669 (3,588) were sold by private enterprise. The numbers in use now amount to many thousands (say 10,000) and in Meiktila District they are almost general. In other districts, especially the Lower Chindwin, they are rapidly taking on.

8. PUBLICATIONS.

Three thousand copies of a Circle Leaflet on hand line-sowing methods and treatment, chiefly for cotton were received from the printing press and this and the leaflet on "Agricultural Lay-out and Anti-Erosion Measures in the Dry Zone" together with other departmental leaflets were distributed on a large scale.

9. SEED AND IMPLEMENT ADVANCE.

The only form of Government loan or advance utilized during the year was the Seed and Implement Advance under which an allotment of Rs. 43,150 (37,000) and an advance of Rs. 43,000 (44,000) were employed in the distribution of seeds and implements. The bulk of the advance is used in the spread of improved cotton as will be seen below but Intercultivators also now take a large sum Details are given for seed in paragraph 6 and for implements in paragraph 7. The more important items were :—

	Values handled. Rs. A. P.
Cotton	34,627 11 0
Intercultivators	4,045 12 0
Theikpan Ploughshares	1,815 14 0

10. MISCELLANEOUS.

King's Birthday Honours (1938).

Certificate of Honour and Silver Betel Box.	U Po Kyan	Agricultural *Akyosaung*, Meiktila Township, Meiktila District.

District Awards.

Meiktila District ...	Good Service Certificate and Silver Bowl.	4 Agricultural *Akyosaungs*.
	Good Service Certificate and Silver Watch.	1 Headman.
	Good Service Certificate and Cash.	3 Headmen.
Myingyan District ...	Good Service Certificate and Silver Bowl.	2 Agricultural *Akyosaungs* (one woman).
	Do.	1 Headman.
Sagaing District ...	Do.	3 Agricultural *Akyosaungs*.

This recognition of work for Agricultural Improvement is having good effect particularly in Meiktila District, and has began to give much encouragement in other districts.

11. ACKNOWLEDGMENT.

I take this opportunity of thanking Mr. H. F. Robertson, I.A.S., now Principal and Professor of Agriculture, Agricultural College, Mandalay, for writing almost the whole of this Report before he left this Circle on transfer.

SAW TUN,
Deputy Director of Agriculture,
Myingyan Circle, Meiktila.

Annual Administration Report of the West Central Circle for the year ended the 31st March 1939.

1. ADMINISTRATION.

I was in charge of the Circle throughout the year and spent 188 days on tour.

U Ba On (1), B.Sc., B.Ag., was Assistant Director of Agriculture and toured for 141 days. He took a short leave from January 22 to March 3.

There were eight Senior Agricultural Assistants in the beginning of the year. One Senior Agricultural Assistant was transferred to the Irrawaddy Circle in exchange for one from there. The Senior Agricultural Assistant in charge of Tobacco work, returned from Mandalay on the 3rd May 1938. His services were again lent to the Economic Botanist, Burma, Mandalay, from the 24th January 1939. Another Senior Agricultural Assistant was temporarily transferred to Hmawbi under the Rice Research Officer on the 29th September 1938 and reposted to this Circle on the 5th January 1939.

Taungdwingyi charge of the East Central Circle was included into this Circle in May 1938 and the services of the Senior Agricultural Assistant in charge were also transferred to this Circle. Thus the strength of this Circle at the end of the year under report was nine Senior Agricultural Assistants.

The Circle has one Central Farm at Allanmyo, one Tobacco Farm at Sa-aing, two Major Seed Farms at Magwe and Pwinbyu and four Minor Seed Farms at Weithike and Kyaukyegyun in Salin Township, at Anaukkaing in Pwinbyu Township and at Pakôkku. The latter two were acquired during the year under report.

During the year, the various charges were held as under :—

Allanmyo Central Farm and Sa-aing Tobacco Farm.—Farm Superintendent, Senior Agricultural Assistant U Hla Phaw Zan, B.Ag., up to 6th October 1938 when he was relieved by U San Maung, B.Ag., Senior Agricultural Assistant. The latter remained in charge till the 24th January 1939 when U Kya Yan, Senior Agricultural Assistant, held charge till the end of the year in addition to his own duties as Senior Agricultural Assistant in charge of district work of Thayetmyo District.

Farm Experiments and Plant-Breeding.—Senior Agricultural Assistant U Kin Myint was in charge throughout the year.

Tobacco Work and District Experiments.—Senior Agricultural Assistant U San Maung, B.Ag . from 3rd May 1938 to the 24th January 1939, when he was transferred to Mandalay under the Economic Botanist, Burma.

District Work.

Charge.	Headquarters.	Officer-in-Charge.
Thayetmyo District	Allanmyo ...	Senior Agricultural Assistant U Bo from 1st April 1938 to 11th June 1938. Senior Agricultural Assistant U Kya Yan from 11th June 1938 to 31st March 1939.
Magwe East ...	Taungdwingyi ...	Senior Agricultural Assistant U Ba Wan.
Magwe West ...	Magwe ...	Senior Agricultural Assistant U Aung Thein.
Minbu South ...	Pwinbyu ...	Senior Agricultural Assistant U San Khin.
Minbu North ...	Salin ...	Senior Agricultural Assistant U Po Htoo from 1st April 1938 to 19th May 1938. Senior Agricultural Assistant U San Khin from 19th May 1938 to 16th June 1938 in addition to his own duties in Minbu South. Senior Agricultural Assistant U Bo from 16th June 1938 to 31st March 1939.
Pakôkku West ...	Pakôkku ...	Senior Agricultural Assistant U Aung Myint from 1st April 1938 to 29th September 1938. Senior Agricultural Assistant U Hla Phaw Zan from 29th September 1938 to 31st March 1939.
Pakôkku East ...	Pakôkku ...	Senior Agricultural Assistant U Htun Sein.

2. SEASON AND CROPS.

The regular monsoon broke out in time in the first half of May and there was general rainfall throughout the Circle. The early rains enabled the cultivators to prepare their land in time. In the first half of June light rains just sufficient enough for sowing *ya* crops were received. The second half of June, the whole month of July and the first week of August produced scanty rains affecting adversely the yield of sesamum and groundnut. Fairly good showers were received in September and October, but they were not of very much use to any rain *ya* crop, although they were good for the preparation of the cold weather crops. There were heavy rains in the middle of November throughout the Circle, after which there was no rain of any importance. In northern part of Minbu, May rain was heavy and continuous, thus making the soil a little too wet for ordinary cultural operations of *ya* land for sowing seeds.

With the early rains which continued till the first week of June, sowing of *ya* crops was almost completed, except in Magwe and Pakôkku where sowing of groundnut had to be postponed and was completed later in the season. Owing to the long break in the middle rains, the outturn of both sesamum and groundnut was estimated to be below normal in Pakôkku, Magwe and Minbu Districts. The heavy early and continuous rains in Thayetmyo District prevented clearing of jungles, and consequently reduced area under sesamum. The cloudy days in the first half of January adversely affected the *Wagyi*

yield in the Thayetmyo District and the insufficiency of middle rains accounted for the low yield of *Wagale* in Natmauk Township of Magwe District. Tobacco crops in the riverine tracts were partially damaged by the early rise of the Irrawaddy River in May. The rains in November too considerably damaged the tobacco seedlings as well as chilli crops. Owing to insufficiency of rains and belated transplanting, the paddy yield in Magwe and northern part of Thayetmyo District was very much depressed.

The price of food grains with the exception of chilli declined generally far below from the 1937 level. The rise in price of chilli was probably due to low production on account of the Irrawaddy flood which destroyed the crop partially.

It cannot therefore be stated that the general economic condition of the cultivator was much improved during the year under report.

3. AGRICULTURAL EDUCATION.

There has been no Farm School in this Circle for imparting Agricultural Education. Proposal for the establishment of a Farm School at the Central Experimental Station, Allanmyo, has been accepted by the Government.

Fifteen selected cultivators, 3 from Taungdwingyi, 5 from Pakôkku, 2 each from Magwe, Pwinbyu and Salin and 1 from Allanmyo Township took a short course of practical training in the improved cropping methods and in making and handling of the improved Agricultural Implements. They all satisfactorily completed the course which lasted for two months.

As in the previous year, the practice of taking cultivators from backward tracts to the nearest area in which improved crops and improved methods of cultivation were demonstrated by the Department was continued.

Apart from regular visitors who used to come to Allanmyo Central Farm and Magwe and Pwinbyu Major Seed Farms for seeds and implements, 60 cultivators from some 30 villages in Myothit and Taungdwingyi Townships visited the Allanmyo Farm and Pyalo tract on the 9th August 1938 and Magwe Farm on the 11th August 1938 to see the improved crops and the improved methods of cultivation. Four prominent cultivators living near Taungdwingyi in the tracts where *pegyi* was sown broadcast went to Pyalo tract where *pegyi* was square sown and the improved implements were used. They were much benefited by their visit. Forty cultivators from Yesagyo visited Chinya and 30 near Pakôkku visited Pakôkku Farm and studied the improved methods of cropping. A group of 58 cultivators from Thambulla and Shwepandaw also paid a visit to the Allanmyo Farm to study the crops and methods of cultivation.

All the Revenue Surveyors of Magwe Township visited the Magwe Farm in September to study the crops and the methods of cultivation. Lectures were delivered to them. They will be very useful to the Department as they are in close touch with the cultivators.

The Senior Agricultural Assistant, Pwinbyu, also delivered a lecture at the conference of the Vernacular teachers held at Pwinbyu. The teachers also visited the Pwinbyu Farm to see the improved crops.

4. Agricultural Research.

Allanmyo Farm is the Central Experimental Station of the Circle. It represents soil and climatic conditions for only a very restricted part of the Circle. It is, therefore, necessary to supplement the work done on it with further experiment work in other part of the Circle. For this work, Magwe, Pwinbyu, Sa-aing and Wetthike Farms are used. Certain experiments are, however, duplicated at cultivators' holdings or other convenient centres in the districts.

The Allanmyo Central Farm grows various dry zone crops, but it is primarily concerned with the cultivation of sesamum, *pèsinngon* and cotton.

The Magwe Farm has works on various sesamums which are more suitable for the northern part of the Circle, and groundnuts.

The Pwinbyu Farm has paddy and other crops suitable for the irrigated paddy land.

The Sa-aing Farm grows tobacco and *kaing* crops.

The Wetthike Seed Farm is primarily devoted to the multiplication of Ngasein-yin C19-26. Trials of paddy strains which are likely to be suitable to the new Salin Canal area are also made.

Detailed results of the experimental work of the Circle are given in the Report of the Allanmyo Station and sub-stations and the work is only briefly summarized here.

Cotton.—Out of 27 various hybrids brought forward from the previous year, 3 were discarded. All flowers were selfed and individual characters of 191 progeny plants were recorded. Of these only 18 promising plants will be carried forward for next season's observation.

Eight cotton-crosses trials were again conducted. On the four-year basis, the crosses, 29/44 and 29/14 stood first again in yield as well as in ginning percentage in the first and second groups respectively. In group III, 30/119-3 topped the list.

The yield test of 3 *Wagyi* × *Wagale* cotton hybrids, 28/A, 29/44 and 30/220 against R37S1 was repeated. The experiment failed to give significant results.

Another yield test of the same 3 cotton hybrids, 28/A, 29/44 and 30/220 against D1EB *Wagale* was continued. The D1EB gives significantly better results than the rest as last year.

The 5 *Wagyi* strains 34/65, R37S1, R38S1, R70S1 and MW800 C465 brought forward from the previous year were tested against Mill *Wagyi* (control). The results were insignificant

The yield test of 6 *Wagyi* strains, 34/15, 34/16, 34/46, 34/50, 34/65 and 34/95 against R37S1 was repeated. The experiment failed to give significant results.

Yield test of 5 *Wagale* strains (2 Mahlaing selections, L11 × W6 and C19 × W5 and 3 Allanmyo selections, T80, T83 and D1EB) was made. The results were not significant.

Sesamum.—The yield test of 4 pure strains, *Gwasan* M26-73, *Padetha* M30-18, *Pokpye* M30-17 and *Seinkho* M30-15 evolved at Magwe Farm was repeated. Both M30-17 and M30-13 yielded significantly better than M26-73 and M30-15, M30-17 being the best yielder.

The yield test of 3 E.B's sesamum strains, *Theikpangyaw* E35-56, *Theikpangyaw* E35-54 and *Thadunbyu* E35-136 and 3 Magwe strains, *Gwasan* M26-73, *Theikpan Hnannet* A26-23 and *Theikpan Hnannet*

A26-89 was repeated at Magwe Farm. Again the results are not significant.

The yield test of 12 single plant selections made in 1933 against *Gwasan* M26-73 was again conducted at Magwe Farm The results are significant. *Lokadat* M33-569 gave the highest outturn.

Two new sesamum varieties from Allanmyo were added to the "S" series consisting of 8 varieties thus making 10 in all. They were sown at Magwe in small plots for observation and selection. This will be repeated.

The yield test of 8 late rain sesamums, Magwe *Hnanni* (control), Pakôkku *Hnanni*, M31-2, M31-3, M31-6, M31-8, M31-10 and M31-11 was again carried out at Magwe Farm. The results are insignificant.

The E.B's 31 strains of cold weather sesamums were grown in lines for observation. Heavy rains destroyed them partially. They will be sown again next year for observation.

At Allanmyo Farm, the yield test of 6 sesamum strains, *Theikpan Hnannet* A26-89 (control), *Theikpan Hnannet* A26-23, *Bokni* A26-17, Economic Botanist's *Yegyaw* E35-54, Economic Botanist's *Shitmyaung* E25-187 and *Shwepyigyi*, gave significant results. E.B's *Yegyaw* E35-54 yielded better than the rest followed by A26-23. E35-54 was under distribution during the year under report.

The following sesamum varieties collected from the district were put down under observation at Allanmyo Farm :—

1. Byauk	...	... From Taungdwingyi.
2. Hlawagyi	...	... From Do
3. Shwepothagaung		... From Tatkon
4. Shwepyigyi	...	... From Thambulla
5. Tasokchun	...	... From Do. and
6. Pyemyint	...	... From Do.

Shwepothagaung gave the best yield followed by *Tasokchun*.

Groundnut.—Thirty-seven exotic varieties of groundnuts including both erect and spreading were put down for further observations, the erect types being sown side by side with Java and the spreading types with local Burmese for comparison. Among the 16 erect types, A.H. 2 and A.H. 32 from Madras again gave better results than Java as last year. Among the spreading types, 5 varieties, namely, Virginia Running, Akola, Big Japan, Bold Chinese North and Illorin were showing better results than that of last year, but the percentages of empty pods of the varieties were higher than local Burmese.

Spacing test of the 3 Burmese groundnut selections, M30-38, M30-74 and M30-144, *plus* 1 Mauritius with local Burmese as control combined with the varietal test was repeated at Magwe. A spacing of $1\frac{1}{2}' \times 9''$ is the best.

Paddy.—Selection of *Ywathaya Byatgale* strains, J20-32 and I23-32 was repeated at Pwinbyu. The former appeared to be splitting while the latter behaved as a true *Byatgale* type. One hundred plants each of I23-32 and J20-32 of true *Byatgale* type were selected for next year observation.

C31-13 paddy from Myaungmya was tried at Pwinbyu. Although it did well the yield was not so good as that of C15-10. Trial will be repeated.

A yield test of Xa97, Xa108, C33-6 and E32-16 with C15-10 as control was conducted. None of the strains was superior in yield to C15-10.

Another yield test of *Medon* strains, D17-88, D31-65, D32-17, D32-33 and D34-5 with local *Kaukkyi Medon* as control was carried out at Pwinbyu. Local *Kaukkyi Medon* gave the best yield followed by D34-5.

At Tawzeik in Salin Township, the Rice Research Officer's paddy yield test consisting of *Mya* C32-1, XF11-160 and local *Sanshwedun* (control) was carried out. *Sanshwedun* gave the best yield closely followed by XF11-160. *Mya* C32-1 lodged badly and was seriously attacked by sparrows on account of its earliness.

Owing to persistent draught the two paddy yield tests [(*a*) B24-92, A31-12, A16-34 and *Aubaw* 7 with local *Panwa* as control and (*b*) A28-6 and A28-8 with local *Panwa* as control], in Taungdwingyi Township failed to give any results.

A yield test of A28-6 and A28-8 with local *Pindo* as control was carried out a Kama, Thayetmyo District. Both A28-6 and A28-8 yielded significantly better than the local *Pindo*. A28-6 was a better yielder than A28-8. This yield test was duplicated at Zein in Allanmyo Township, but it failed.

Another yield test of A16-34, A31-12 with local paddy as control was conducted at Maungmalok and duplicated at Ngamegan in Allanmyo Township. The test failed in both places.

Xa97 and Xa108 were tried in Salin as well as in Pwinbyu. Compared to the local paddies, the former did very well.

At Wettlike C30-3 (Cheduba paddy), a short lived strain yielded 34 baskets per acre which is nearly equivalent to the average yield of the locality. Owing to its earliness it seems popular among the poorer classes.

C24-71 (*Shamyein* paddy) did well at Thayagon in Salin Township with a yield of 42 baskets per acre.

C15-10 was tried at Bizat and Kyon in Salin Township where it had never been grown before. In spite of the incidence of "Gwinma" disease its yield was better than that of the local paddy.

Trial of C14-8 paddy was continued in Pwinbyu Township. Like last year its yield per acre was about 50 baskets which was not less than the average yield of local paddy.

Xa97, Xa108, C15-10 and C19-26 were tried in Myothit Township where, it was said, water supply from the canal was regular. Owing to drought, the trail failed in many places, except at Tatkon village opposite Myothit where C15-10 and C19-26 thrived well.

Trial of A28-6 was successful and the strain is spreading in Dayindabo, Kyiyakon and Nyaungbinseik in Allanmyo Township.

A28-8 yielded well at Kama and Thambulla and is becoming very popular.

A31-12 was successfully tried and its spread is expected in Dayindabo and Letpagan tracts in Allanmyo Township.

Miscellaneous.—Cropping experiment with (1) Burmese groundnut (2) Small Japanese intersown with *pasinngon* and (3) Theikpan sesamum followed by jowar was conducted at Magwe. Burmese groundnut alone gave the best return. Next came Theikpan sesamum followed by jowar. Japanese groundnut was poor, the weather being not favourable.

This experiment will be substituted by a Rotation experiment, the plan of which has been given by the Economic Botanist, Mandalay.

A Rotation experiment with the following croppings. (1) Japanese groundnut intersown with N.E. *pèsinngon*. (2) sesamum followed by jowar, (3) maize followed by *pègyi* and (4) *Wagyi* alone was conducted at Allanmyo. Japanese groundnut intersown with *pèsinngon* gave the best return. This was followed by maize and *pègyi*.

This experiment will be substituted by a Rotation experiment with more treatment combinations. The plan for this experiment has been furnished by the Economic Botanist, Mandalay.

Gram.—Twenty five strains of gram were tested against wilt disease at Chinya, Sinbyugyun and Minhla by the Economic Botanist under the immediate supervision of the Senior Agricultural Assistants, Pakôkku, Salin and Thayetmyo respectively. Germination of the grams tried at Minhla and Sinbyugyun was bad while that at Chinya was good. Out of the 25 strains, K311, K318, K319, K3114, K3118, K3124, Bassein 35-35 and P21 were found to be fairly promising.

Pèsinngon.—Three strains of *Pèsinngon*, T15, T16 and Z33 were tested against New Era *pèsinngon* at Allanmyo Farm. The results are not significant.

Wheat.—Pusa 80-5 tried last year appeared to be rust resistant. As it is beardless it is exposed to sparrow attack. Bearded wheats, Pusa 114 and Pusa 120 were therefore introduced and tried side by side with Pusa 80-5 in two places, Kyaungon and Ywadanshe in Salin Township. No rust appeared in any of the three wheats. Life period of P120 is about 7 days longer than P80-5 and 7 days shorter than P114. It (P120) tillers well and has compact ear-heads. It is, therefore, likely to be popular. P114 is too long lived.

Pèdisein.—A selection by the Economic Botanist, Mandalay, was, put down again in six different places in Magwe Township. It gave a very good yield everywhere.

Tobacco.—As the research work on tobacco had been transferred to Mandalay, only 12 selected varieties of tobacco were grown in Sagaing Farm for seed purpose.

Bean.—A yield test of Black been, Large Pearl, *Pèngapi* 25-37, *Okenashi* 32-49, *pègyi* and *pèbyugale* was carried out at Allanmyo Owing to bad germination especially of the first three varieties, no useful results are obtained.

5. Pests and Diseases.

Pests and diseases did very little damage on the whole. The following were reported during the year :—

1. *Po-ii-gaung* (Grubs of Chafer beetles) in Minbu, Magwe and Pakôkku Districts.
2. Hairy Caterpillars (*Diochrisia obliqua*) in Minbu and Thayetmyo Districts.
3. *Sit-po* (*Schoenobius bipunctifer*) in Minbu District.
4. Cut worms in Thayetmyo District.
5. Grain smut on jowar in Minbu and Pakôkku Districts.
6. Wilt disease on gram in Minbu District
7. " Gwinma " disease in Minbu District.
8. Rust on wheat in Minbu District.

Leaflets containing instructions on the preventive and remedial measures against the pests and diseases were freely distributed.

6. Demonstration and Propaganda.

For demonstration work during the year, the Circle was divided into 25 charges, 5 in Pakôkku, 8 in Magwe, 6 in Minbu and 6 in Thayetmyo. Each charge was under one temporary demonstrator. Within the 25 charges, 359 village centres were selected. At these village centres, crops new to the area or improved strains of crops already grown were demonstrated on 435 plots covering an area of 1,068·5 acres, while new implements and new cropping methods were demonstrated on 1,595 plots covering an area of 4,395·7 acres.

The following two statements show district by district the demonstrations which were carried out :—

Demonstration of New or Improved Seeds.

District.	Rains sesamum.		Groundnut.		Winter sesamum Theikpan *Hnanni.*		Short-lived Groundnut.		*Pesingon.*		Improved jowar.		Improved cotton.		Various.	
	No. of plots.	Acre-age.	No. of plots.	Acre-age.	No. of plots.	Acre-age.	No. of plots.	Acre-age.	No. of plots.	Acre-age.	No. of plots.	Acre-age.	No. of plots.	Acre-age.	No. of plots.	Acre-age.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Thayetmyo	1	0·75	6	6·25	..	...	8	4·60	—	...	...	...	1	2·00	...	...
Magwe	93	308·15	8	10·80	10	24·00	1	0·30	21	83·75	7	4·10	17	29·60	25	27·00
Minbu	45	74·70	2	1·75	23	33·00	8	7·75	1	2·00	...	...	...	...	3	2·50
Pakôkku	49	134·50	6	21·00	13	37·00	...	...	28	117·00	43	110·50	9	22·00	7	3·50
Total ...	188	518·10	22	39·80	46	94·00	17	12·65	50	202·75	50	114·60	27	53·60	35	33·00

Demonstration of New Implements and New Methods of Cropping.

District.	Ploughing.		Sesamum line-sowing.		*Pèsinngon* inter-sown with sesamum or groundnut.		Groundnut line-sowing.		Groundnut square-sowing.		Intercultivating with Bullock hoe, Theikpan Intercultivator or Allan htoon-do-gale.		Various.	
	No. of plots.	Acreage.	No. of plots.	Acreage.	No. of plots.	Acreage.	No. of plots.	Acreage.	No. of plots.	Acreage.	No. of plot;s	Acreage.	No. of plots.	Acreage.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Thayetmyo	...	...	23	48·75	28	77·60	10	30·50	20	45·75	87	216·85	6	12·50
Magwe	115	208·25	115	421·05	39	126·50	8	9·60	3	7·00	255	700·40	200	167·40
Minbu	123	152·95	40	82·50	11	27·00	...	...	2	8·00	117	209·20	7	14·00
Pakôkku	272	858·90	51	108·50	52	221·00	...	...	...	...	201	621·00	10	20·50
Total ...	510	1220·10	229	660·80	130	452·10	18	40·10	25	60·75	660	1747·45	223	214·40

The principal implements demonstrated were Theikpan plough, Theikpan intercultivator, Allan htoondo-gale, Planet Junior Bullock Hoe and Cyprus plough.

With extended demostration, 2,001 (1,124) Theikpan shares and 45 (15) Cyprus ploughs were distributed during the year. It is estimated that at least 7,000 Theikpan ploughs were in use during the year.

The distribution of 58 (48) Planet Junior Bullock Hoes is satisfactory the demand being generally from the Dayindabo-Pyalo tract of Thayetmyo District, where the line-sowing method has been adopted by the cultivators.

Theikpan intercultivator designed in 1934 in this Circle are still very popular with poor cultivator who could not afford to buy costly imported ones. Six hundred and thirteen intercultivators as against 594 in the previous year were distributed.

Allan htoon-do-gale designed in 1935 is mostly popular in tracts where maize is grown. The total distribution during the year was 495.

The Chaff Cutter designed in this Circle was also demonstrated. It can be copied and easily made by any cultivator. The total number in use in this Circle was 2,434.

The method of line-sowing of sesamums has become general in tracts where demonstration were carried out. The estimated area under line-sown sesamum during the year was 31,221 acres.

Intersowing of *pèsinngon* with groundnut has been adopted considerably especially in the Pakôkku District on account of extra income of Rs. 5 to Rs. 10 per acre received by the cultivator. Yield of groundnut is not affected in any way if pròper spacing of *pèsinngon* is done. The estimated area under this method was 19,457 acres.

To show that there is saving in seed and weeding expenses, demonstration of line-sowing of groundnut was continued in tracts in Minbu and Thayetmyo Districts where it was not shown before. The estimated area under line-sowing of groundnut was 154,329 acres.

A further saving in groundnut seed and weeding expenses is affected by sowing groundnut in square. The demonstration of square-sowing of groundnut was repeated in 25 places in tracts in Magwe, Minbu and Thayetmyo Districts where it was not followed. The area under square-sown groundnut was 24,731 acres. These are in places where demonstration was carried out before.

Rain sesamums demonstrated were *Theikpan hnannet* A26-23 (a full branched variety), *Theikpangyaw* E35-54 and *Theikpan hnanbyu* M26-73. The former is popular in places where long lived varieties are grown and the latter two are in demand in places where short-lived varieties are required. These three strains give higher yield and higher oil percentage.

Groundnuts demonstrated were Magwe Farm selection M30-38 and short-lived erect variety. The former has given a consistent high yield at the Magwe Farm trials.

Winter sesamum demonstrated was *Theikpan hnanni*. It is a selected strain which gives high acre yield.

Pèsinngons demonstrated were New Era, a big white seeded variety and E.B's C10, a small red seeded variety. The former is popular in the southern part of the Circle where rainfall is heavy and the latter in the northern part where the rainfall is light. New Era *pèsinngon* fetches a premium of Rs. 50 to Rs 75 over other *pèsinngons*.

Jowar demonstrated was Ramkel (a selected strain). It has a shorter life-length than any of the local jowars and gives a higher acre outturn.

Under various, paddy, *malpe*, *pèdisein*, butter-bean, Madagascar bean, tobacco, sugarcane and potato were included.

Seed Farms.—The Circle has four Seed Farms, namely, Magwe Major Seed Farm with an area of 204 acres for the production of selected groundnut and sesamum, Pwinbyu Major Seed Farm with an area of 160 acres for C15-10 paddy, Wetthike Seed Farm with an area of 96 acres for C19-26 paddy and Kyaukyegyun Seed Farm with an area of 18 acres for wilt resistant gram.

In addition, two new Seed Farms were acquired during the year, one at Pakôkku with an area of 40·97 acres for groundnut and sesamum and the other at Anaukkine in Pwinbyu Township with an area of 2·01 acres for *kaing* crops.

Besides the above mentioned Seed Farms, Local Seed Farms privately owned and supervised by the officer of the Agricultural Department were also organized in tracts which are far away from the Departmental Seed Farms. During the year under report 122 Private Seed Farms with a total area of 476 acres were in operation.

The following shows the number of Private Seed Farms together with the area and the crops grown :—

District.	Improved beans.		Paddy.		Ground-nut.		*Jower.*		Sesamum.		*Pèsinngon*		Wilt-resistant gram.		Cotton.		Sugarcane.		Total.	
(1)	No. (2)	Area in acres. (3)	No. (4)	Area in acres. (5)	No. (6)	Area in acres. (7)	No. (8)	Area in acres. (9)	No. (10)	Area in acres. (11)	No. (12)	Area in acres. (13)	No. (14)	Area in acres. (15)	No. (16)	Area in acres. (17)	No. (18)	Area in acres. (19)	No. (20)	Area in acres. (21)
Thayetmyo ...	...	...	10	74·50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	74·50
Magwe ...	...	...	8	15·50	7	11·50	...	...	13	52·80	2	14·00	...	...	...	...	4	3·00	34	96·80
Minbu ...	1	0·50	13	117·84	5	6·00	3	5·00	7	11·50	4	12·00	1	1·00	...	...	...	...	34	153·84
Pakôkku ...	2	7·00	5	9·00	6	26·00	7	19·00	14	40·00	8	41·00	1	5·00	1	4·00	...	...	44	151·00
Total ...	3	7·50	36	216·84	18	43·50	10	24·00	34	104·30	14	67·00	2	6·00	1	4·00	4	3·00	122	476·14

Seed Distribution.—During the year under report 369,317 (338,568) lbs. of seeds were distributed by the Department. The following statement shows District by District the seeds sold :—

Seed Distribution by Department.

Kind of Seed. (1)		Thayetmyo. (2)	Magwe. (3)	Minbu. (4)	Pakôkku. (5)	Total. (6)
		lbs.	lbs.	lbs.	lbs.	lbs.
Theikpan Hnannet	...	2,035	1,670	861	112	4,678
Theikpan Hnanbyu	...	...	4,254	180	224	4,658
Theikpan Hnanni	...	...	1,597	...	...	1,597
Pusa seasamum	...	...	...	206	...	206
Yegyaw sesamum	...	99	216	315	224	854
Sesamum unclassified	...	...	962	...	...	962
Wagyi ...	...	817	...	100	180	1,097
Wagale ...	...	25	...	...	610	635
Cambodia ...	...	432	...	...	...	432
Pèsinngon ...	...	840	2,230	436	1,810	5,316
A16-34 paddy	...	1,380	...	...	...	1,380
A28-6 paddy ...	...	1,380	...	...	...	1,380
C15-10 paddy	...	...	450	2,34,000	...	2,34,450
C19-26 paddy	...	...	450	44,100	...	44,550
Theikpan Bommedewa	...	...	...	...	3,880	3,880
Paddy (unclassified)	...	690	8,000	...	...	8,690
Spanish groundnut	...	392	250	...	440	1,082
Japanese groundnut	...	516	540	682	1,090	2,828
Burmese groundnut	...	90	19,550	72	4,650	24,362
Mauritius groundnut	...	90	250	...	...	340
Ramkel jowar	...	...	140	...	5,170	5,310
Saccoline ...	...	...	540	325	56	921
Jowar (unclassified)	...	245	9,000	...	...	9,245
Wheat ...	...	...	...	250	...	250
Gram ...	...	...	420	880	2,880	4,180
Improved beans	...	9	160	...	2,650	2,819
Various ...	...	165	2,228	400	422	3,215
Total	...	9,205	52,907	2,82,807	24,398	3,69,317

In addition to the above seeds sold, the following were also distributed :—

Kind. (1)		Thayetmyo. (2)	Magwe. (3)	Minbu. (4)	Pakôkku. (5)	Total. (6)
Kew pineapple	...	8	150	400	161	719
Sapota seedlings	...	33	20	3	36	92
Mango grafts	...	12	16	15	9	52
Maltese lime gooties	...	28	44	...	146	218
Grape vine cuttings	...	5	...	5	17	27
Pomelo ...	...	...	...	...	1	1
Sweet lime ...	...	...	...	...	2	2
Sugarcane setts.	...	...	...	...	10,000	10,000
Total	...	86	230	423	10,372	11,111

Apart from the distribution made by the Department, the following seeds were distributed by the Supervised ***Akyosaungs*** who keep records in Form Agricultural Station 23.

Seed Distribution by Akyosaungs.

Kind of Crop. (1)	Thayetmyo. (2)	Magwe. (3)	Minbu. (4)	Pakôkku. (5)	Total. (6)
	lbs.	lbs.	lbs.	lbs.	lbs.
Paddy	9,120	26,000	79,610	12,000	126,730
Groundnut	...	1,790	432	159,246	161,468
Ramkel jowar ...	...	...	...	16,458	16,458
Sesamum	2,325	4,158	825	2,430	9,738
Pèsinngon	3,440	864	...	27,186	31,490
Cotton	...	350	...	890	1,240
Various	...	1,200	...	...	1,200
Total ...	14,885	34,362	80,867	218,210	348,324

Crop Spread.—The total estimated area under improved crops for the whole Circle was 187,323 (161,435) acres as tabulated in the statement given below :—

Kind of Crop. (1)	Thayetmyo. (2)	Magwe. (3)	Minbu. (4)	Pakôkku. (5)	Total. (6)
	Acres.	Acres.	Acres.	Acres.	Acres.
Improved sesamum ...	16,810	5,580	2,349	14,065	38,804
Selected paddy ...	8,650	350	50,727	3,900	63,627
Wilt resistant gram ...	850	20	11,244	8,250	20,364
Improved *Pèsinngon* ...	6,910	6,920	6,560	23,647	44,037
Selected groundnut ...	425	821	43	10,440	11,729
Selected cotton ...	...	175	105	815	1,095
Improved jowar ...	...	1,070	115	3,369	4,554
Improved beans ...	...	...	37	1,670	1,707
Sugarcane	...	25	...	...	25
English vegetable ...	...	1,150	32	...	1,182
Various	...	140	59	...	199
Total ...	33,645	16,251	71,271	66,156	187,323

In these areas, in the record of the Agricultural Improvement in the West Central Circle must be added the area under improved cropping methods worked with the implements recommended by the Department. They are as under :—

Method. (1)	Pakôkku. (2)	Minbu. (3)	Magwe. (4)	Thayetmyo. (5)	Total. (6)
	Acres.	Acres.	Acres.	Acres.	Acres.
Sesamum line sown ...	23,615	1,635	3,746	2,225	31,221
Groundnut square sown ...	...	291	19,680	4,760	24,731
Pègyi square sown ...	...	...	...	2,200	2,200
Groundnut line sown ...	...	3,389	149,680	1,260	154,329
Pèsinngon intersown with groundnut.	19,457	...	158	...	19,615
Pèsinngon intersown with sesamum.	7,185	6,510	1,767	...	15,462
Sesamum before paddy ...	...	10,500	...	...	10,500
Sesamum and cotton intersown.	...	...	150	...	150
Various	...	...	986	300	1,286
Total ...	50,257	22,325	176,167	10,745	259,494

The acreage claimed are those only from the localities in which demonstrations by us have been done.

Work with Local Bodies.—The following are the Agricultural Societies which are very helpful to the Department in propaganda and demonstration work in the Pakôkku District :—

1. Kyigan Agricultural Society.
2. Myaing Agricultural Society.
3. Lingadaw Agricultural Society.
4. Yesagyo Kyun Agricultural Society.

In Magwe District, the Magwe *Taungthugyi Association continued* to function well. The successful work of the Magwe Marketing Committee in standardizing weights and measures during the year was mainly due to the activity of the Association.

In Minbu District, the Tawzeik Agricultural Society was very helpful in multiplication and distribution of pure paddy.

In Thayetmyo District, Minhla Agricultural Society continued to function well and its members were extensively growing C10 *pèsinngon.*

Kama Agricultural Society was helpful in multiplication and distribution of the paddy strain A28-8.

Thambulla, Myohla, Shwepandaw and Tindaw Agricultural Societies in Allanmyo Township were properly formed with the help of the local *Sayadaws*. These societies and the *Sayadaws* assisted the Department

in connection with demonstration, seed-distribution and organization of Allanmyo True Weights and Measures Committee.

Marketing Improvement.—Groundnut marketing in Magwe was, for years, conducted in a manner disadvantageous to the cultivator. Cotton marketing in Allanmyo was also the same. The cultivator lost 5 to 15 per cent of his produce in weighing or measuring made when marketing. Magwe True Weights and Measures Committee (Magwe Marketing Committee) which was formed about the end of the groundnut season last year and Allanmyo True Weights and Measures Committee which was formed at the beginning of this year's cotton season, started their respective work, during the year under report.

At Magwe, 27 platform weighing machines were submitted to the Committee for check and adjustment. A Sub-Committee consisting o the Secretary (Deputy Director of Agriculture, West Central Circl), and 4 Committee members representing traders (Burmese 1, Chinese 1, brokers 1 and cultivators 1), carried out the check and found that only 3 of the 27 machines in actual use were correctly adjusted, the error on the others (all on the side of under-weighment) lying between 3 to 10 per cent over the standard weight. Adjustments were made and the adjusting screws wired and sealed. The token weights used with the machines were also checked, the holes in each recorded, and the weights themselves marked with the Secretary's initials.

Regarding the use of basket, the practices of shaking, heaping and pressing in measuring groundnut were stopped and the Committee approved *Zala* (wooden basket), having the following dimensions was introduced :—

Top	...	...	$17\frac{3}{8}'' \times 17\frac{3}{8}''$
Bottom	...	...	$14'' \times 14''$
Vertical height	...	...	$14\frac{5}{8}''$

The basket is locally reckoned as holding 40 lbs. F.A.Q. groundnut.

Local bamboo baskets usually become flexible and bigger after using for some time. Therefore the Committee is not undertaking the check of local bamboo baskets but is encouraging traders to give these up and use the *Zala*. Forty *Zalas* were made by brokers and traders and submitted for check. A further 50 were ordered by the village societies. The Agricultural Department is supplying these at Rs. 1-8 each.

Arrivals of groundnut carts into Magwe were recorded by the Committee.

The following were the arrivals :—

				Carts.
1938	September	...	...	270
	October	...	...	1,370
	November	...	...	4,453
	December	...	...	5,619
1939	January	...	...	4,991
	February	...	...	3,920
	March	...	...	4,019
			Total ...	24,648

Each cart contained 20 baskets of 40 lbs.

From the use of checked weights, weighing machines and baskets, the gain to the cultivator was put at Rs. 2 per cart by traders, brokers and cultivators. It means that an additional half lakh of rupees found its way into the pockets of the cultivator.

Allanmyo True Weights and Measures Committee consists of the Deputy Commissioner, Thayetmyo, as President, the Subdivisional Officer, Allanmyo, as Vice-President, the Deputy Director of Agriculture, Magwe, as Secretary, an Assistant Marketing Officer, Rangoon, 3 representatives of the millers, 9 representatives of the traders and brokers, and 12 representatives of the cultivators.

Working Sub-Committee consisting of 3 buyer-representatives (millers and brokers), 3 cultivator-representatives, the Assistant Marketing Officer, Rangoon, and the Secretary (Deputy Director of Agriculture, West Central Circle), was also formed to standardize weights and measures at Shwepandaw and Thambulla weekly bazaars which are important cotton marketing centres of Allanmyo Township. At these centres, weighings were made on the "Sin" (a wooden instrument to weigh a certain fixed weight). In Thambulla, the "Sins" were constructed to make weighings of *hna-lon-gyi* (12 viss) *plus* 1 viss for the weight of a *tin-tein-saung* (blanket), the container in customary use, and in Shwepandaw, *ta-lon-gyi* (11 viss) *plus* 1 viss for the container. The weighings were thus in lots which nominally amounted to 13 viss or 12 viss. An average weight of the containers in use was 0·75 viss only. When the "Sins" were actually checked, all of them were found to be weighing 3 per cent to 9 per cent more than their reputed weights. In addition to this, the "Sins" were found to be so insensitive that unless tapped during the actual weigh ing a further extra weight might pass unrecorded. In actual sale transaction tapping was not usually done. At Shwepandaw, small spring balances were used by sub-brokers who purchased cotton for the mill-brokers. These spring balances are notoriously inaccurate and easily subject to manipulation in use. When they were checked, their variation was found to be lying (all on the short side) between 2 and 5 lbs. in a weighment of 10 viss (36 lbs).

The cotton-grower lost 5 to 10 per cent of his produce in weighing made when marketing.

An attempt was therefore made to get buyers to discontinue use of the "Sin" and substitute the "Ya-zu" (beam-balance locally made in wood). All the buyers have taken up the "Ya-zu". The Agricultural Department had to supply 20 in addition to the number made by some buyers themselves.

Iron weights checked and certified by the Rangoon Corporation and re-guaranteed by a seal affixed on behalf of Allanmyo True Weights and Measures Committee were also made available. Fifty-seven ten-viss weights and 180 smaller weights were sold.

Hna-lon-gyi and *ta-lon-gyi* weighings were abolished and actual ten-viss weighing was adopted.

Apart from sale made between bazaar days, the amounts of cotton sold on the bazaar days up to 31st March were recorded as follows :—

—	Thambulla.	Shwepandaw	Total.
February ...	13,000	19,500	32,500
March. ...	67,600	206,950	274,550
Total ...	80,600	226,450	307,050

This year cotton crop is very poor.

It is estimated that a total amount of five lakhs viss cotton is sold on the bazaar days for the whole cotton season (*i.e.*, four months, from February to end of May).

Agricultural Shows.—Agricultural stalls were set up at the undermentioned places :—

1. The Sethushin Pagoda Festival, Pakangyi, Yesagyo Township 12th to 16th April 1938.
2. The Myaing Pagoda Festival, Myaing, 9th to 13th May 1938.
3. The Koktheinnayon Pagoda Festival, Salin, 17th to 26th May 1938.
4. The Myathalun Pagoda Festival, Magwe, 1st to 10th October 1938.
5. The Paungdaw-u Pagoda Festival, Sinbyugyun, 2nd to 7th November 1938.
6. The Swe-baukkan Pagoda Festival, Swebaukkan, Chauk Township, 23rd to 30th November 1938.
7. The Thaygehla Pagoda Festival, Pakannge, Chauk Township, 1st to 7th December 1938.
8. The Htange-daw Bus-stand, Htange-daw, Pauk Township, January to 31st March 1939.
9. The Shwe-settaw Pagoda Festival, Shwe-settaw, Sagu Township, 4th February to 4th March 1939.
10. The Shwepaunglaung Pagoda Festival, Thamadaw, Pauk Township, 25th February to 5th March 1939.
11. The Shwe-in-daung Pagoda Festival, Taungdwingyi, 11th to 22nd March 1939.
12. The Thambulla Weekly Bazaar, Thambulla, Allanmyo Township, 24th January to 31st March 1939.
13. The Shwepandaw Weekly Bazaar, 2nd February to 31st March 1939.

Weekly Village Bazaars.—The weekly village-bazaars at Shwepandaw, Thambulla and Kyaukpadaung started by the Agricultural Department in 1928 continued to flourish. The Allanmyo True Weights and Measures Committee formed during the year has been organizing to improve marketing of cotton at Thambulla and Shwepandaw bazaars.

7. IMPLEMENTS.

The implement distributed during the year comprised 2,001 (1,124) *Theikpan* Ploughshares, 613 (594) *Theikpan* Intercultivators, 495, (557) Allan *htoon-do-gale* 58 (48) Planet Junior Bullock Hoes, 44 (15) Cyprus ploughs, 505 (206) *Theikpan* plough frames, 83 (75) harrows and 41 Chaff Cutters (a design from this Circle).

8. PUBLICATION AND SUPPLY OF INFORMATION.

Nineteen thousand four hundred and six leaflets were distributed during the year out of which 10,331 were the West Central Circle leaflets on line sowing of sesamum, *pèsinngon* intersown with *Hnanyin* or short-lived groundnuts and method of preparing *pèsinngon* dishes and the remaining were the Departmental cultivator's leaflets. The Circle leaflets deal with matters from a local standpoint and as such they usually made a more definite appeal than would the Departmental publications.

9. SEED AND IMPLEMENT ADVANCE AND AGRICULTURAL LOANS.

Working of the Seed and Implement Advance.—The Seed and Implement Advance and Allotment sanctioned for the year were Rs. 15,000 and Rs. 14,000 respectively. For the purchase of Seed and Implements, withdrawals from the treasury amounted to Rs. 13,999-3-6 and refunds on account of the sale proceeds of these to Rs 9,667-10. The value of stock in hand on the 31st March 1939 was Rs. 14,123-10.

The Agricultural Loans.—The Agricultural Loans issued during the year by the Deputy Commissioners for the purchase of the Departmental seeds and implements were as given below :—

District.		Amount of Agricultural loans issued.
		Rs.
Pakôkku	...	1,318
Magwe	...	1000.
Minbu	...	1,015
Thayetmyo	...	*Nil*
Total	...	3,333

10. SERICULTURE.

Shwepandaw Sericultural Station.—Demonstration in the cultivation of mulberry, rearing silk worms and reeling of silk thread was continued.

As a result of demonstration and propaganda, 5 mulberry plantations have been started at their villages by the Chins, 3 of which have been well looked after.

During the year 259 layings were distributed as against 123 in the previous year. 1,000 lbs. of mulberrry cuttings were also supplied to the rearers.

Five girls took a short course training at the station in cultivation of mulberry, rearing silk worms and reeling of silk thread.

Reeling was demonstrated at Thambulla and Shwepandaw on bazaar days.

The progress in extension of sericulture in Shwepandaw and its surrounding village-tracts is very slow indeed, but as the local Chins have started taking interest in the industry, it will likely be extended.

Kalama Sericultural Station.—The cultivation of mulberry, rearing silk worms and reeling of silk thread were demonstrated.

The demand for seed has slightly increased and in all 3,751 (3,593) layings were distributed during the year.

The demonstration in rearing silk worms and reeling of silk thread was conducted at Taungdwingyi during the Shwe-in-daung Pagoda Festival.

Unlike Shwepandaw, the villagers of Kalama and its neighbouring villages do not seem to be keen to take up rearing of silk worms, as they can find better paying work along the railway line. It was stated that the younger generations are not willing to take up the industry but it is still lingering on among the old folks.

MAUNG GALE,
Deputy Director of Agriculture,
West Central Circle, Magwe.

ANNEXURE.

Report of the Second Season's Working of the Co-operative Tobacco Research Scheme in Burma, 1938-39.

This report covers the results of work done during the tobacco season *1938-39* both with the pucca-built barn funded from the Imperial Council of Agricultural Research grant and also with a kutcha-type barn built with departmental funds. The results of some small trials elsewhere than in Mandalay also funded departmentally are included as it is desirable to have all tobacco work reported together and a strict division of the work done under the co-operative scheme and departmentally is not possible.

Staff.—The Economic Botanist, Burma was on leave from 6th October *1938* till 12th April *1939* and the work was in charge of the officiating Economic Botanist who had one Senior Agricultural Assistant U San Maung, B.Ag., and one Fieldman, Maung Tin, seconded from the West Central Circle to assist. Staff of the botanical section also took part in the work as required. The Economic Botanist, Burma, assumed charge as from the 12th April 1939. The Indian Leaf Tobacco Development Company, Limited, kindly loaned us the services of an expert Indian curer from Madras who carried out curings of the first four barns.

Recording Instruments.—A recording hair hygrometer and a recording thermometer were received after the close of the first season's work and were utilized to obtain records during the season under report. Their value is doubtful for work of this nature. The thermometer serves to record the times the fireman slept.

The Kutcha Barn.—This is of the type used in Guntur District and the plans and specifications were kindly supplied by the Indian Leaf Tobacco Development Company, Limited. It measures $20' \times 16'$ and carries 1,000 sticks. The mud walling common in India is not known in Burma and as a substitute thick bamboo matting stuffed with burnt paddy husk was used, the walls being plastered with cow dung and mud inside and out. Cast iron work for the furnace was found to be more expensive here than wrought iron and the latter was substituted. The barn complete cost Rs. 562-14. It has been built alongside the pucca barn so that both can be worked simultaneously with the same staff.

District Trials.—It was arranged to have small trials of Virginia tobaccos at various places on *kon* lands (*i.e.* land not subject to river flooding) where there seemed to be prospects of producing bright leaf and of expansion later. Seedlings for most of these were supplied from Mandalay. The district trials were :—

	Harrison's Special Acres.	Adcock Acres.
Shwegyin (E.C.C.)	¼	...
Shawbyugaing	½	½
Pyinmana	¼	...
Kyette, Nr. Pyawbye ...	¼	¼
Talkon Farm	¼	¼
Myingyan Seed Farm ...	½	½
Total ...	2	1½

Part of this leaf was flue cured but most of it was shade cured. It would have been better if larger lots had been flue cured especially the leaf from Myingyan and Kyette.

Nurseries.—Seed beds were first made on land near the barns, 20′ × 4′, and 6 inches high. The first sowing was on 15th August 1938. There was very little germination and it was found that red ants were rapidly carrying away the seed. Fresh sowings were made on the 25th August and baits of chopped straw, syrup and sodium arsenite were used. The ants neglected the baits but continued to carry away the tobacco seeds. Additional beds were sown with double the normal seed rate and as a safeguard beds were started in the botanical area at the Mandalay Agricultural College. Grass (Thekke) or bamboo (Wagat) shade was provided for all nurseries. Owing to heavy rains there was much damage on some beds from damping off. This was controlled to some extent with Cheshunt compound and Bordeaux mixture.

A trial was made with various repellants to combat the red ant nuisance in seed beds, using equal quantities of Paris Green, Turmeric powder, Sulphur powder, earth oil in sand, and Pyrethrum powder, and Harrison's Special Seed, each being compared with unmixed seed of the same variety. Large numbers of ants visited the control and sulphur-treated plots; a few were seen on turmeric-treated plots but practically none on the plots treated with other repellants. The Paris Green plots did not germinate well, but seedlings were thick in the turmeric and earth oil plots where damping off occurred later. On the whole Pyrethrum and turmeric were found to be best and the latter was used subsequently as being cheaper and easily available.

Of the two Virginian varieties Adcock was very slow in germination, slow in growth in the seedling stage and very susceptible to diseases. Harrison's Special was much more vigorous and hardy.

Mud planting.—It had been suggested that the system of mud planting in untilled *kyun* land as soon as possible after the waters had subsided should be tried and the first planting was made on the 15th and 16th October with Harrison's Special. Local cultivators plant brinjals in this way. On the 24th October there was an unexpected late rise of the river which completely submerged the plants for 10 days and destroyed them. This late flood delayed normal tillage operations and made planting late.

About 1½ acres of land not subject to annual flooding near the barn site was planted on 17th, 18th and 30th October. This was rather late for this type of land and soil moisture was deficient making growth poor. Mid-rains planting would be better for such areas.

Seedlings supplied to the East Central Circle and Myingyan Circle for district trials were 13,500 of Adcock and 19,760 of Harrison's Special.

Transplanting.—The land chosen was not what local growers would consider best for tobacco as it was slightly lighter. It was not however sufficiently sandy for successful cigarette leaf crops. The mechanical analyses done by the Agricultural Chemist, Burma, did not show any large differences from those of the soils on which tobacco was grown in 1938 and which are given in the first report for 1937-38. Transplanting on the *kyun* land commenced on 22nd November and was completed on the 28th December. The spacing was 3′ × 2′. Over 78,000 seedlings were used for the initial plantings. Cut-worm (*Agrotis ypsilon* Rott.) began to attack the young plants from the first week of December and the damage from this pest increased day by day. Baits of Paris Green, jaggery and bran prepared by the

Entomologist were put at the base of every plant but did not control the cut-worms. Even plants a foot high were destroyed. Calcium arsenate mixed with fine sand in the proportion of 1 to 10 was also ineffective in controlling the insect. Hand picking was started on the 11th December and continued to 28th January. The list below gives the numbers of cut-worms caught and destroyed :—

Date.	Number of cut-worms.	Date.	Number of cut-worms.
11-12-38	560	13-1-30	4,342
12-12-38	420	14-1-39	6,058
13-12-38	391	15-1-39	6,315
15-12-38	234	16-1-39	5,936
16-12-38	141	17-1-39	4,760
18-12-38	138	18-1-39	3,045
27-12-38	792	19-1-39	2,245
1-1-39	88	20-1-39	3,992
2-1-39	632	21-1-39	2,933
5-1-39	815	22-1-39	2,891
6-1-39	276	23-1-39	3,599
7-1-39	262	24-1-39	2,433
8-1-39	302	25-1-39	2,867
9-1-39	1,344	26-1-39	731
10-1-39	1,306	27-1-39	604
11-1-39	4,124	28 1-39	419
12-1-39	5,026		
		Total ...	70,021

These catches were from an area of about 12 acres. As a result of the damage done replacements were very heavy, amounting to replanting, and continued from 4th December to 30th January when the supply of suitable seedlings ran out. In all 33,516 seedlings of Adcock and 30,210 of Harrison's Special were used for replacements and about 1½ acres of Adcock and ½ acre of Harrison's Special had to be abandoned. Apart from any other considerations this pest makes it practically impossible to raise good cigarette leaf on *kyun* land of this kind. A manurial trial was completely invalidated by this pest. The late rise in the Irrawaddy made planting late and coincident with the peak of the cut-worm season. Results from trials on *kon* lands indicate that for cigarette tobacco better results are likely to be obtained by raising middle and late rains crops on such land and in future work will be directed towards discovering the best methods of doing this. Cut-worm is not known to be a pest on *kon* lands.

A preliminary curing was done on 7th February 1939 using the pucca-built barn. Only a small quantity of bottom leaf was used, and the grades obtained are shown below :—

First Curing Pucca Barn.

Variety.	Green wt., lbs.	Dry wt., lbs.	Grades.								Loss in wt. lbs.
			1 IM	2 IO	3 ID	4 IBF	4A ICX	5 IX	6 IS	Scrap.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special.	550	1 0	...	...	4-0	10-4	36-8	3-0	18-12	18-8	11-0
Per cent ...	...	100	...	...	3·9	10·0	35·8	2·9	18·4	18·1	10·8

The grade 4A, known in India as I C X, is that leaf which is rather green but which will eventually yellow up after some months in case. The I B F leaf yellows up more quickly, in three to four weeks.

Labour Statement—

		Rs.	A.	P
Picking, stringing and loading	...	3	15	0
Carting to barn	...	0	8	0
Firemen, 2M for 4 days ...	...	5	0	0
Unloading, 2W ½ day ...	...	0	5	0
Fuel, 650 long pieces at Rs 8/6 per 1,400	..	3	14	0
Total	...	13	10	0

The second curing was made with Harrison's Special picked in the afternoon of 24th February 1939. Leaf was left on mats overnight in the field, carted to the barn, graded, strung and loaded the next day. Loading the barn did not finish till 8-30 p.m. In addition to the main lot of leaf from Shangale *kyun* leaf from the College estate, from Myingyan Seed Farm and from the two places in the East Central Circle was included.

Second Curing : Pucca Barn.

Variety and Place. (1)	Green wt., lbs. (2)	Dry wt., lbs. (3)	Grades, lbs. and oz. 1 I M (4)	2 I O (5)	3 I D (6)	4 I B F (7)	4A. I C X (8)	5 I X (9)	6 I S (10)	Scrap. (11)	Loss in wt., lbs. (12)
Harrison's Special (Shangale).	1,150	220	0-10	20-12	28-3	49-8	22-8	9-4	44-12	29-12	14-11
Per cent ...	...	100	0·2	9·4	12·8	22·5	10·2	4·2	20·3	13·5	6·6
Harrison's Special (Shawbyugaing).	44	7	...	0-7	1-3	2-3	0-6	...	1-0	1-3	0-10
Per cent ...	...	100	...	6·3	17·0	31·3	5·4	...	14·3	17·0	8·9
Harrison's Special (College).	38	6	...	0-8	1-3	1-3	0-14	0-4	1-3	0-9	0-4
Per cent ...	...	100	...	8·3	19·8	19·8	14·6	4·2	19·8	9·4	4·2
Harrison's Special (Kyette).	68	17	0-1	2-3	5-8	4-8	1-4	...	2-12	0-7	0-5
Per cent ...	...	100	0·4	12·9	32·4	20·6	7·4	...	16·2	2·6	1·8
Harrison's Special (Myingyan).	160	31	0-3	4-5	11-13	4-8	1-8	...	6-2	1-0	1-9
Per cent ...	...	100	0·6	13·9	38·1	14·5	4·8	...	19·8	3·2	5·0
Adcock (Myingyan).	138	24½	1-1	2-0	12-0	3-0	0-5	...	5-0	0-8	0-10
Per cent ...	...	100	4·5	8·5	51·1	12·8	1·3	...	21·3	2·1	2·7

Considering the three top grades only, the Shangale percentage of 22·4 is the lowest. Shawbyugaing at 23·3 is little better. On the black-cotton soil (paddy field) at the College the quality was slightly

higher (28·1 per cent) but leaf was small. The *kon* lands at Kyette and Myingyan with 45·7 and 52·6 per cent respectively gave far higher quality. These were all Harrison's Special. The Myingyan Adcock gave 64·1 per cent of top grades of large leaf. From this it appears that leaf from *kon* land is roughly twice as good as leaf from *kyun* land. It must also be noted that leaf from the districts had to travel long distances to the curing barns. The curing was done by the expert from Madras.

Labour Statement—

		Rs.	A.	P.
Picking, 2M, 1B and 20W ...	...	3	12	0
Carting	...	1	0	0
Stringing and loading, 1M, 1B and 20W	...	7	0	0
Firemen, 2M for 5 days ...	...	6	4	0
Unloading, 4W whole day ...	...	1	4	0
Fuel, 840 long pieces at Rs. 4/8 and 800 short pieces at Rs 4-4 ...	...	8	12	0
Total	...	28	0	0

The third curing was of Harrison's Special on 7th March 1939. Leaf was picked in the afternoon and left on mats overnight. Stringing and loading was done the next day and completed by 8-0 p.m. Some leaf from the East Central Circle and the College farm were also included. The curing was done by the Indian expert.

Third Curing: Pucca Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz.								Loss in wt., lbs.
			1 I M	2 I O	3 I D	4 I B F.	4A I C X	5 I X	6 I S	Scrap.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special (Shangale).	1,014	185	0-5	14-0	36-10	31-4	19-12	1-8	31-0	35-0	15-9
Per cent ...	...	100	·06	7·6	19·8	16 9	10·7	0 8	16·7	18·9	8·4
Harrison's Special (College).	34	6	...	...	1-4	0-5	...	...	3-12	0-4	0-7
Per cent	...	100	...	...	20·8	5·2	...	...	62·5	4·2	7·3
Harrison's Special (Shawbyugaing).	177	34½	...	1-13	6-6	5-1	1-10	...	5-7	12-15	1-4
Per cent ...	...	100	...	5·3	18·5	14·7	4·7	...	15·8	37·5	3·6
Harrison's Special (Kyette).	68	11	...	0-6	1-15	2-4	1-4	...	2-10	2-6	0-3
Per cent ..	...	100	...	3·4	17·6	20·5	11·4	...	23·9	21·6	1·7

The quality of the Shangale leaf in this curing was slightly better than in the second curing. The leaf from the *kyun* was the best of

this curing. The leaf from the districts was not so good but the barn was run for the main crop and the leaf which had been sent long distances was partly yellow at the time of loading.

The fourth curing consisted of Harrison's Special with the first picking of Adcock from the Shangale fields. Picking was in the afternoon of the 23rd March and loading was done the next day.

Fourth Curing: Kutcha Barn.

Variety. (1)	Green wt., lbs. (2)	Dry wt., lbs. (3)	Grades, lbs. and oz. 1 I M (4)	2 I O (5)	3 I D (6)	4 I B F (7)	4A I C X (8)	5 I X (9)	6 I S (10)	Scrap. (11)	Loss in wt., lbs. (12)
Harrison's Special	1,048	174	0-4	19-0	49-12	42-4	20-12	1-10	10-12	20-4	9.6
Per cent ...	...	100	·05	10·9	28·6	22·1	15·8	0·6	6·2	11·6	5·3
Adcock ...	631	102	0-8	13-4	51-0	17-8	3-0	1-8	8-4	...	7-0
Per cent ...	...	100	0·5	13·0	49·0	17·2	2·9	1·5	8·0	...	6·9

The Adcock leaf yellows much faster in the barn than Harrison's Special and on this curing has given the better quality leaf, though the growth was no better in the field. The top grades of Adcock amounted to 62·5 per cent as against 39·5 per cent for Harrison's Special. It must be noted however that the barn was run for Adcock and thus Harrison's Special did not receive the best treatment.

Labour Statement—

		Rs.	A.	P.
Picking, 2M and 21W ...	...	3	12	6
Carting	...	1	8	0
Stringing and loading, 2M and 21W	...	7	7	0
Fireman, 1M for 5 days ...	...	3	2	0
Unloading, 4W whole day ...	...	1	4	0
Fuel, 1,960 pieces at Rs. 6 per 1,000	...	11	13	0
Total	...	28	14	6

On the 19th March 0·58 inch of rain fell and the plants picked up moisture and delayed ripening. In order to save what leaf was already ripe this was picked for rack curing. Leaf received from Tatkon farm was also rack cured as this was badly rim-burnt and not fit for flue curing. This shade curing was not successful as the leaf all cured dark and later strong dry winds badly damaged the leaf on the racks, leaving little but the mid-ribs. It appears that rack curing will only be successful when the leaf is good and the conditions optimal with little or no wind. With a curing season so late violent winds of short duration are to be expected and these completely destroy any dry leaf on racks. It may be that tobacco grown on *kon* lands as middle or late rains crops might stand a better chance but then the air would be moister when the leaf is on the racks and so curing would be

slower and possibly a bright colour would not be obtainable. The good results obtained in 1938 were apparently lucky. The green weight of the leaf put on racks was Harrison's Special 470 lbs. and Adcock 170 lbs. from Shangale with 28 and 68 lbs. respectively from Tatkon. All this must be considered as a complete loss owing principally to wind damage.

The fifth curing was done on 10th April. Leaf was picked in the morning and loaded the same day. Loading was completed by 8 p.m. Again both Harrison's Special and Adcock were included together as there was insufficient ripe leaf of either variety to fill a barn.

Fifth Curing : Kutcha Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz.								Loss wt., in lbs.
			1 IM	2 I O	3 I D	4 I B F	4A I C X	5 I X	6 I S	Scrap.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special (Shangale-kyun.)	1,258	215	...	8-4	70-4	25-0	7-4	7-0	72-8	15-0	9-12
Per cent ...	...	100	...	3·8	32·7	11·6	3·4	3·3	33·7	7·0	4·5
Adcock (Shangale-kyun.)	524	90	0-1	14-12	43-12	12-0	...	4-8	13-4	...	1-11
Per cent ...	...	100	...	16·4	48·6	13·3	...	5·0	14·7	...	1·9

The Harrison's Special has not given nearly such good leaf as the Adcock, its top grades only amounting to 36·5 per cent as against 65·0 per cent and the scrap and IS grades accounting for 40·7 per cent as against 14·7 per cent for Adcock.

Towards the end of this curing when the temperature had reached 156 strong wind disturbed the top ventilator and the temperature could not be maintained. It is unlikely, however, that this damaged the leaf as by that time it was dry.

Labour Statement.—

		Rs.	A.	P.
Picking, 2M and 23W ...	...	7	14	0
Carting	...	2	0	0
Fireman	...	2	8	0
Unloading	...	2	11	0
Fuel, 1,085 pieces at Rs. 6 per 1,000	...	6	8	0
Total	...	21	9	0

The sixth curing was again a mixture of the two varieties. Picking was done in the morning of the 17th April and loading was completed by 6 p.m. the same day.

Sixth Curing : Pucca Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz.								Loss in wt., lbs.
			1 I M	2 I O	3 I D	4 I B F	4A I C X	5 I X	6 I S	Scrap.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special (Shangale-kyun).	791	139	...	3-4	20-4	18-8	4-8	3-0	16-8	59-12	13-4
Per cent ...	...	100	...	2·3	14·6	13·3	3·2	2·2	11·9	43·0	9·5
Adcock Shangale-kyun.	878	153	...	8-4	62-12	12-4	...	1-12	50-4	11-0	6-12
Per cent ...	...	100	...	5·4	41·0	8·0	...	1·1	32·8	7·2	4·4

The superiority of Adcock is again very evident, 46·4 per cent of top grades against only 16·9 per cent for Harrison's Special. Also the percentage of scrap was much higher for Harrison's Special.

Labour Statement—

	Rs.	A.	P.
Picking, 2M and 30W	10	0	0
Carting	2	0	0
Fireman	1	9	0
Unloading	3	13	0
Fuel, 935 pieces at Rs. 6 per 1,000 ...	5	9	9
Total ...	22	15	9

The seventh curing consisted entirely of Harrison's Special. Leaf was picked on the morning of the 18th April and loading was completed by 6 p.m. the same day.

Seventh Curing : Kutcha Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz.								Loss in wt. lbs.
			1 I M	2 I O	3 I D	4 I B F	4A I C X	5 I X	6 I S	Scrap.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special (Shangale-kyun).	1,288	244	...	0-12	18-0	...	...	...	26-4	184-0	15-0
Per cent ...	...	100	...	0·03	7·4	...	...	...	10·7	75·4	6·1

At 1 a.m. on the 21st April when the temperature had reached 126° strong wind and heavy rain caused trouble. The top ventilator was forced open and rain got in causing much sponging. This accounts for the unsatisfactory results from this curing. The original type of top ventilator for the kutcha barn was too light and not air tight. After this curing a new ventilator of heavier material was fitted and gave much better results.

Labour Statement—

	Rs.	A.	P.
Picking etc., 1M. and 25W.	7	11	0
Carting	1	8	0
Fireman	1	9	0
Unloading	3	3	0
Fuel, 840 pieces at Rs. 6 per 1,000 ...	5	9	0
Total ...	19	8	0

The eighth curing was a mixture of the two varieties. Picking was done on the morning of the 28th April and loading was completed by 6 p.m. the same day.

Eighth Curing : Pucca Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz.								Loss in wt., lbs.
			1 I M	2 I O	3 I D	4 I B F	4A I C X	5 I X	6 I S	Scrap.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special (Shangale-kyun).	970	148	...	4-12	28-0	36-8	22-12	3-8	14-8	33-8	4-8
Per cent ...	...	100	...	3·2	18·9	24·6	15·4	2·4	9·8	22·6	3·0
Adcock (Shangale-kyun).	800	150	0-8	12-8	43-12	18-12	9-0	9-0	24-4	20-0	12-4
Per cent ...	...	100	0·3	8·3	29·1	12·5	6·0	6·0	16·2	13·3	8·2

Again the Adcock has proved the better curer, 37·7 per cent of top grades against 22·1 for Harrison's Special.

Labour Statement.—

	Rs.	A.	P.
Picking, etc.	9	6	0
Carting	2	0	0
Fireman	3	2	0
Unloading	2	3	0
Fuel, 1,021 pieces at Rs. 6 per 1,000 ...	6	2	0
Total ...	22	13	0

The ninth curing was done in the kutcha barn which was loaded the day after the pucca barn, that is on the 29th April. Leaf was picked in the morning and loaded the same day.

Ninth Curing: Pucca Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz. 1 I M	2 I O	3 I D	4 I B F	4A I C X	5 I X	6 I S	Scrap.	Loss in wt., lbs.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special. (Shangalekyun).	1,880	264	...	2¼	36	29	12½	2½	35½	131	15¼
Per cent ...	...	100	...	0·8	13·6	11·0	4·7	0·9	13·4	49·6	5·8

The results are unsatisfactory, more than half of the leaf being badly sponged.

Labour Statement—

	Rs.	A.	P.
Picking, etc.	10	6	0
Carting	1	0	0
Fireman	2	8	0
Unloading	1	14	0
Fuel, 900 pieces at Rs. 6 per 1,000 ...	5	6	6
Total ...	21	2	6

The tenth curing was a mixture of Adcock and Harrison's Special in the pucca barn. Picking was done on 4th May in the morning and the barn was loaded by 6 p.m. the same day.

Tenth Curing: Pucca Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz. 1 I M	2 I O	3 I D	4 I B F	4A I C X	8 I X	6 I S	Scrap.	Loss in wt., lbs.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special (Shangalekyun).	505	97	...	...	9	13¾	6	3½	9¾	54¾	...
Per cent ...	...	100	...	...	9·2	14·0	6·1	3·6	10·0	56·0	...
Adcock (Shangalekyun).	863	166	...	2	25¼	24½	24½	11½	33	35¼	10
Per cent ...	...	100	...	1·2	15·2	14·7	14·7	6·9	19·9	21·2	6·2

In neither variety is the result satisfactory but it may be noticed that Adcock has given more top grade leaf again.

Labour Statement—

	Rs.	A.	P.
Picking, etc.	8	12	0
Carting	2	0	0
Fireman	2	8	0
Unloading	1	14	0
Fuel, 907 pieces at Rs. 6 per 1,000 ...	5	7	0
Total ...	20	9	0

The following day, 5th May, the kutcha barn was loaded entirely with Harrison's Special leaf.

Eleventh Curing : Kutcha Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs and oz.								Loss in wt., lbs.
			1 I M	2 I O	3 I D	4 I B F	4A I C X	5 I X	6 I S	Scrap.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special (Shangalekyun).	995	189	...	...	12½	21½	12½	1½	20½	118½	2
Per cent ...	...	100	...	...	6·6	10·8	6·6	0·8	10·8	62·6	1·1

Again the behaviour of this variety is unsatisfactory, far too much sponging taking place, and the leaf largely refusing to yellow up.

Labour Statement—

	Rs.	A.	P.
Picking, etc.	8	12	0
Carting	2	0	0
Fireman	2	8	0
Unloading	1	14	0
Fuel, 976 pieces at Rs. 6 per 1,000 ...	5	13	9
Total ...	20	15	9

The final curing of Harrison's Special, the twelfth barn, was started on the 18th May. Heavy rain on the 13th, 15th, 16th and 17th had hindered work and made the leaf green. The leaf was also tops and very irregular, much of it being small. It is doubtful whether it would be commercially profitable to put such leaf through a barn, though actually the results of this curing were not as bad as was expected.

Twelfth Curing : Kutcha Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz.								Loss in wt., lbs.
			1 I M	2 I O	3 I D	4 I B F	4A I C X	5 I X	6 I S	Scrap.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special (Shangalekyun).	1,320	301	...	¾	29	29	16½	5¾	47¾	166¼	6
Per cent ...	...	100	...	0·2	9·6	9·6	5·5	1·9	15·9	55·4	2·0

Considering the poor quality of the leaf and that it was harvested after recent heavy rain the results are surprisingly good when compared with earlier curings.

Labour Statement—

	Rs.	As.	P.
Picking, etc.	10	10	0
Cartage	2	0	0
Fireman	2	8	0
Unloading	1	14	0
Fuel, 802 pieces at Rs. 6 per 1,000 ...	5	6	6
Total ...	22	6	6

The last of the Adcock leaf was picked on the 19th May and loaded the same day into the pucca barn.

Thirteenth Curing: Pucca Barn.

Variety and Place.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz.								Loss in wt., lbs.
			1 I M	2 I O	3 I D	4 I B F	4A I C X	5 I X	6 I S	Scrap.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Adcock (Shangalekyun).	1,144	220	...	1¼	29¼	21	9¾	2¼	38	111¼	7¼
Per cent ...	...	100	...	0·6	13·3	9·5	4·5	1·0	17·3	50·6	3·3

This result is only slightly better than the corresponding barn of Harrison's Special. It consisted of top leaf and had received heavy rain a few days before picking.

Labour Statement—

	Rs.	A.	P.
Picking, etc.	12	8	0
Carting	2	0	0
Fireman	1	14	0
Unloading	1	14	0
Fuel, 830 pieces at Rs. 6 per 1,000 ...	4	15	9
Total ...	23	3	9

Excluding small lots from district trials there were 12 curings or part curings of Harrison's Special and 6 for Adcock. The total grades obtained from flue cured leaf for both varieties are shown below :—

Combined Grades from all Curings.

Variety.	Green wt., lbs.	Dry wt., lbs.	Grades, lbs. and oz.								Loss in wt., lbs.
			1 I M	2 I O	3 I D	4 I B F	4A I C X	5 I X	6 I S	Scrap	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Harrison's Special.	12,844	2290	1½	74½	344	308	182½	42½	357½	867	113½
Per cent ...	...	100	...	3·2	15·0	13·4	8·0	1·8	15·6	37·9	4·9
Adcock ...	4,840	881	1	52	255¾	106	46¼	30½	167	177½	44
Per cent ...	...	100	...	5·9	29·0	12·0	5·2	3·5	19·0	20·1	5·0
Harrison's Special, 1938. (per cent)	...	...	2·6	12·9	37·9	13·2	...	6·8	26·6	...	...
Adcock, 1938. (per cent)	...	...	1·7	16·2	30·9	4·4	...	11·4	35·4	...	...

A comparison with the 1938 grades shown at the bottom of the above table shows that the 1939 crop was much inferior in quality. This is mainly due to the heavy cut-worm attack and consequent irregularity and to the late rise in the river. The crop was much ranker and less suitable for flue curing than in 1938.

I am dissatisfied with the seed of Harrison's Special. Our own local seed I consider off type and I also feel some doubt as to the quality of the Pusa seed. I consider a fresh supply from America is essential.

Yields per Acre.—Owing to the very irregular stand and the many gaps in some plots I do not consider it advisable to record yield figures this year. They were for the most part rather high, of the order of 900 to 1,000 lbs. of dried leaf per acre. These are somewhat lower than in 1938 but still indicate rather rank growth as seems to be the rule on this type of riverine soil. For the same reasons no attempt to work out value of produce per acre is made.

Rack Curing.—With good quality leaf in 1938 some very promising results were obtained with rack curing. This year with poorer leaf to start with the rack curings were all dark. Winds during the hot weather did much damage to dry leaf on the racks. In the district trials where most of the leaf was rack cured the results from the cigarette-making view point may be taken as complete failures—all the leaf was dark. I suspect some of the samples of leaf sent to me from the districts had been well watered before packing. Much better quality green leaf is wanted before rack curings are likely to be successful.

Pests and Diseases.—The serious damage by cut-worms (*Agrotis ypsilon* Rott.) has already been described. The red ant nuisance in nursery beds was serious until control measures had been found.

Other insect pests were not serious. They included the moth *Chloridea assulta* Guen. which slightly damaged top leaves, the capsid bug *Gallobelicus crassicornis* Dist. found on the buds and flower heads, the beetle *Gonocephalum depressum* F. which was found in large numbers at the roots of tobacco seedlings which were dead or dying. It apparently took wheat bran—Paris green baits put down for cut-worms as arsenic was detected in their bodies. The big brown cricket *Brachytrypes portentosus* Licht. did a small amount of damage to seedlings by cutting the stems. The larvæ of the moth *Prodenia litura* Fab. occurred in small numbers but did slight damage. Aphids appeared on a few plants and seemed to favour rugose leaves rather than smooth types.

Frog eye spot (*Cercospora nicotiana* Ell. *et* Evn.) occurred on one field. It was kept in check by spraying and by removal of affected leaves. The attack was mild. A few plants died of bacterial wilt (*Bacterium solonacearum* Sm.). Mosaic and leaf curl was not as severe as in 1938 and the attack developed late, chiefly on top-most leaves unfit for flue curing.

Expenditure.—The expenditure under different heads for the working season from 1st August 1938 to 31st May 1939 are shown below:—

33. Agriculture, D. Agricultural Education and Research, e. Expenditure in connection with Tobacco Research Scheme.

Expenditure from 1st August 1938 to 31st May 1939.	Amount Rs. A. P.	Remarks.
(3b) Allowances, Honoraria, etc. (Fluctuating) Travelling Allowance.	446 1 0	This does not include Travelling Allowance spent from Economic Botanist's ordinary allotment.
(9) Works (cost of kutcha barn) ...	562 14 0	
(4) Contingencies	* 1,369 12 3	

Travelling Allowance spent for Tobacco work from Economic Botanist's ordinary allotment = Rs. 529 8 0 Voted.
„ 2 6 5 0 Non-Voted.

33. Agriculture, c. Agricultural Experiments.

Expenditure from 1st August 1938 to 31st May 1939.	Amount. Rs. A. P.	Remarks.
Tobacco Experiments	†672 7 6	

(4) *Contingencies.*

	Rs.	A.	P.
* Wages	891	1	3
Firewood	60	2	0
Rent of land	105	0	0
Seeds and seedlings ...	6	14	0
Miscellaneous including cartage, etc. ...	306	11	0
Total ...	1,369	12	3

c. *Experiments.*

	Rs.	A.	P.
† Wages	279	1	0
Firewood	69	0	0
Rent of land	147	0	0
Chemicals	26	0	0
Miscellaneous	150	0	0
Total ...	672	0	0

Receipts.—Under the head C. Deposit Account of the grant made by the Imperial Council of Agricultural Research for tobacco research a sum of Rs. 959-13 was paid into the treasury during the year ending 31st March 1939.

There has been a considerable saving of firewood due to bulk purchases at the beginning of the season, Rs. 129-5 for two barns as against Rs. 112-15 for one in 1938. It may be noted that the curings done by the expert curer from Madras consumed nearly twice as much fuel per barn as curings done by our own staff. The Indian curer tended to keep ventilators open a very long time though his leaf did not seem to dry out as well as ours, judging from the humidity graphs. By closing ventilators earlier the fuel bill was halved but there was no rise of humidity within the barn.

The drain on the Travelling Allowance allotment of the Economic Botanist on account of extra work undertaken by the ordinary staff of the section may be noted. The temporary staff entertained for tobacco work is quite inadequate for the work and much falls on the heads of the regular botanical staff.

Expenditure on wages has been lowered and amounts to Rs. 1,170-14-9 for two barns as against an expenditure in 1938 of Rs. 965-8-3 for one bran. It has been found that considerable savings in running expenses can be made when a pair of barns are worked together and a larger group of barns would doubtless further reduce costs.

D. RHIND,—14-6-39,
Economic Botanist, Burma, Mandalay.

APPENDIX I.

The analyses of the leaf cured in the season 1937-38 were not completed in time for inclusion in the first report. They are given below :—

Lab. No.	Grade	Moisture percentage.	Percentage on Dry Matter.	
			Protein.	Nicotine.
(1)	(2)	(3)	(4)	(5)
Adcock.				
H 41 ...	I O ...	6·5	11·3	1·75
H 42 ...	I D ...	6·7	10·8	1·57
H 43 ...	I BF ...	5·6	11·6	1·66
H 44 ...	I X ...	6·3	12·9	1·49
	Mean ...	6·28	11·65	1·62
Pusa H1 42.				
H 45 ...	I O ...	7·6	11·8	1·81
H 46 ...	I D ...	6·0	11·9	2·36
H 47 ...	I B F ...	8·1	15·7	2·27
H 48 ...	I X ...	6·6	13·4	2·83
	Mean ...	7·08	14·2	2·32

The protein content is rather high in H 142 and the effect of this was noticeable in the ranker smoking quality of the cigarettes. The nicotine content of Adcock is rather low. By an oversight no samples of Harrison's Special were analysed and all flue cured leaf was sold before the mistake was noticed.

PART III.

Appendices.

APPENDIX I.

Glossary.

Local and Technical names.	English equivalent.	Botanical equivalent.
Bokni ...	A variety of early sesamum ...	*Sesamum orientale* Linn.
Boktaung ...	A variety of early sesamum ...	*Sesamum orientale* Linn.
Byat ...	An Upper Burma ngasein paddy	*Oryza sativa* Linn.
Byatkhale ...	A variety of early sesamum ...	*Sesamum orientale* Linn.
Cambodia ...	A variety of cotton	*Gossypium hirsutum* Linn var. mov. *Cambodia*
Cheduba ...	A variety of early paddy ...	*Oryza sativa* Linn.
Cheduba-Laroong ...	A variety of early paddy ...	*Oryza sativa* Linn.
Ekalai ...	A bold-grained paddy ...	*Oryza sativa* Linn.
Emata ...	A variety of paddy ...	*Oryza sativa* Linn.
Gwagale ...	A variety of early sesamum ...	*Sesamum orientale* Linn.
Gwa-htun ...	A wooden cultivator ...	
Gwasan ...	A variety of early sesamum ...	*Sesamum orientale* Linn.
Gyoke ...	An implement for deepening furrows.	
Hnanbyu ...	An early white-seeded sesamum	*Sesamum orientale* Linn.
Hnannet ...	A black-seeded sesamum ...	*Sesamum orientale* Linn.
Hnan-ni ...	A red-seeded sesamum ...	*Sesamum orientale* Linn.
Htoon-do-gale ...	Small bullock hoe	
Jowar ...	*Great millet*	*Sorghum sps.*
Kalagyi ...	A variety of paddy	*Oryza sativa* Linn.
Kaing ...	Riverine soil subject to inundation.	
Kauk-kyi ...	Long-lived paddy	*Oryza sativa* Linn.
Kauklanti ...	Flowering parasite	
Kauklat ...	Medium-lived paddy ...	*Oryza sativa* Linn.
Kaukyin ...	Short-lived paddy ...	*Oryza sativa* Linn.
Kayangya ...	A bold-grained paddy ...	*Oryza sativa* Linn.
Kapas ...	Raw cotton	
Kazin ...	Small bund	
Kon ...	Riverine soil not subject to inundation.	
Kunpyaung ...	Great millet (fodder types) ...	*Sorghum dochna* (Forsk.) Snowden.
Kyandon ...	Beam or Soil leveller ...	
Kyun ...	Riverine soil	
Laroong ...	A variety of paddy	*Oryza sativa* Linn.
Lawkadat ...	An early sesamum	*Sesamum orientale* Linn.
Letywezin ...	A variety of paddy	*Oryza sativa* Linn.
Lonthay ...	A variety of paddy	*Oryza sativa* Linn.
Matpe ...	Black gram	*Phaseolus mungo* Linn.
Medon ...	A bold-grained paddy ...	*Oryza sativa* Linn.
Moki Lima ...	Burma butter bean ...	*Phaseolus lunatus* Linn.
Myit-po ...	A disease of paddy in which the plants turn yellow and die.	
Ngacreinthee ...	Long-lived-paddy. ...	*Oryza sativa* Linn.
Ngayunwa ...	Thin long-grained irrigated paddy	*Oryza sativa* Linn.
Ngasein ...	A bold-grained paddy ...	*Oryza sativa* Linn.
Pathetha ...	A variety of early sesamum ...	*Sesamum orientale* Linn.
Patnai ...	A variety of Indian paddy ...	*Oryza sativa* Linn.
Pyaung-bu ...	Maize	*Zea mays* Linn.
Pebyugale ...	Rangoon white bean ...	*Phaseolus lunatus* Linn.
Pedesein ...	Green grain	*Phaseolus aureus* Roxb.
Pegya ...	Rangoon red bean	*Phaseolus lunatus* Linn.
Pegyi ...	Hyacinth bean	*Dolichos lablab* Linn.

APPENDIX I.

Glossary—*concld.*

Local and Technical names.	English equivalent.	Botanical equivalent.
Pelun ...	Cow pea	*Vigna unguiculata* (Linn) Walp.
Pe-nga-pi ...	Soy bean	*Glycine max* (Linn) Merr.
Pesinngon ...	Pigeon pea (arhar dhall) ...	*Cajanus cajan** (Linn) Millop.
Pe-yin ...	Rice bean	*Phaseolus calcaratus* Roxb.
Popyit ...	An early sesamum	*Sesamum orientale* Linn.
Pwinbyu ...	Selected white flowered cotton	*Gossypium neglectum.* Tod Sub-Var *burmanicum* Gammie.
Pyaungnet ...	A fodder millet with black glumes	*Sorghum dochna* (Forsk.) Var. *melliferum* Snowden.
Pyegyi ...	Early black seeded sesamum ...	*Sesamum orientale* Linn.
Ramkel jowar ...	Great millet	*Sorghum* sps.
Sabasi ...	A long-lived variety of paddy ...	*Oryza sativa* Linn.
San-pyaung ...	Great millet (grain types) ...	*Sorghum roxburghii* Var. Hians Stapf.
San-shwedun lonshwe	A variety of paddy	*Oryza sativa* Linn.
Saukyaik ...	An early sesamum	*Sesamum orientale* Linn.
Seinkho ...	An early sesamum	*Sesamum orientale* Linn.
Shannyein ...	A Lower Burma kyaukkyi paddy	*Oryza sativa* Linn.
Shatgale white ...	An early sesamum	*Sesamum orientale* Linn.
Shitmyaung ...	Eight-chambered late sesamum	*Sesamum orientale* Linn.
Shwetachaung ...	An early sesamum	*Sesamum orientale* Linn.
Shweat ...	Long-grained Mandalay irrigated paddy.	*Oryza sativa* Linn.
Sieva Pole Lima ...	A lima bean	*Phaseolus lunatus* Linn.
Si-zon ...	A Burmese wooden oil crusher	
Tabindaing ...	An early sesamum	*Sesamum orientale* Linn.
Taingdaung ...	An early sesamum	*Sesamum orientale* Linn.
Taungya ...	Shifting hill-side cultivation ...	
Tawbatpe ...	Burma butter bean	*Phaseolus lunatus* Linn.
Thaman ...	A marsh grass ...	*Leersia hexandra* Sw.
Theikpan ...	A prefix used to designate products of the Agricultural Department, Burma.	
Wagale ...	Early cotton	*Gossypium neglectum.* Tod. Sub-Var. *burmanicum* Grammie.
Wagyi ...	Late cotton	*Gossypium obtusifolium,* Roxb. Var. *nankin* Grammie.
Ya ...	Upland area cultivation	
Yegyaw ...	An early sesamum	*Sesamum orientale* Linn.
Yethelay ...	A variety of paddy	*Oryza sativa* Linn.
Ywetpo ...	A disease of paddy in which the leaves turn yellow.	
Viss ...	Burmese unit of weight equal to 3·64 lbs.	
Zambwet ...	An early variety of paddy ...	*Oryza sativa* Linn.

APPENDIX—II.

APPEN

Statement showing Working of Major Seed

Name of Seed Farm. (1)	Area in acres. (2)	Total production (in baskets). (3)	Total seed taken over by the Department for distribution (in baskets). (4)	Actual distribution from seed taken over previous year (in baskets). (5)	Gross rent per acre charged. (6)
1. Thatôn	150·69	4,134	4,134	2,839	8 baskets
2. Pegu	180·33	5,728	3,530	2,960	10·6 „
3. Paungdè	125·70	5,934	3,135	2,128	16·6 „
4. Zigôn	20·80	540	...	305	9·2 „
5. Henzada	148·00	4,251	4,112	1,339	14 „
6. Maubin	154·82	4,948	4,522	1,122	15½ „
7. Bassein	151·42	3,444	...	1,163	7¾ baskets per 100·81 acres ; 9½ baskets per 20·49 acres ; 8½ baskets per 21·63 acres.
8. Pyapôn	184·68	7,024	...	2,275	16 baskets per 142·91 acres ; 13½ baskets per 39·70 acres.
9. Pyu	146·01	5,947	4,932	2,505	18 baskets
10. Nyaunglebin ...	17·19	609	609	...	13 „
11. Kyehmon	305·42	...	271	21	Rs. 9 for 1st class ; Rs. 5 for 2nd class ; Rs. 3 for 3rd class. Rs. 1-8 for 4th class.
12. Taungtha ...	16·15	...	...	...	Rs. 60 for whole year.
13. Meiktila	23·64	...	...	...	Rs. 80 for whole year.
14. Myingyan	197·54	...	...	104	Rs. 2-8 per acre for 40·92 ; Rs. 3 per acre for 156·62.

IX II.

arms for the year ended the 31st March 1939.

Tenants' ebate for ure seed.	Nett rent assessed. (a) Collected up to 31st March 1939.	(b) Total outstandings up to 31st March 1939.	Gross rent per acre proposed for next year.	Remarks.
(7)	(8)		(9)	(10)
Per cent.	Rs. A. P.	Rs. A. P.		
20	790 11 0	...	8 baskets	
20	1,131 5 0	...	10·6 ,,	Only 159·64 acres under paddy cultivation.
20	1,436 10 0	...	16·6 ,,	Only 121·63 acres under paddy cultivation.
20	115 8 0	...	9·2 ,,	
20 on 62·13 acres. 15 on 68·87 acres.	1,483 9 0	...	14 ,,	No rebate on 12·57 acres.
20	1,714 12 3	...	15½ ,,	Rebate refused on 16·51 acres.
20	805 0 0	...	Same as last year.	8·49 acres not assessed to rent on account of experimental area and building site.
20	2,271 4 3	...	Do.	
20	1,494 12 0	...	18 baskets	
20	132 4 0	...	13½ ,,	
Rs. 190	1,620 4 0	230 7 0	Rs. 8 for 1st class ; Rs. 5 for 2nd class ; Rs. 3 for 3rd class ; Rs. 1-8-0 for 4th class.	
...	60 0 0	...	Rs. 60 for whole year.	
...	80 0 0	...	Rs. 80 for whole year.	
...	572 4 0	...	Rs. 2-8 per acre for 40·92 acres. Rs. 3 per acre for 156·62 acres.	

APPEN

Statement showing Working of Major Seed

Name of Seed Farm. (1)	Area in acres. (2)	Total production (in baskets). (3)	Total seed taken over by the Department for distribution (in baskets. (4)	Actual distribution from seed taken over in previous year (in baskets). (5)	Gross rent per acre charged. (6)
15. Pwinbyu	160·68	7,461	4,835	4,480	25 baskets (inclusive of water-rate).
16. Magwe	204·63	183 2,769	83 656·75	32·56 844	Rs. Y^1 = 5 per acre Y^2 = 4 ,, Y^3 = 2-8 ,, lbs. Y^1 = 280 ,, Y^2 = 224 ,, Y^3 = 140 ,,
17. Padu	104·56	...	...	...	Rs. 3-8-0 for 28 24 acres. Red upland per acre Rs. 5 for 64·11 acres. Black lowland per acre 12·08 acres at 8 baskets per acre.
18. Chiba	83·60	3,246	3,210	2,792	10·08 acres at 20 baskets per acre; 15·83 acres at 19 baskets per acre; 18·64 acres at 17 baskets per acre; 21·50 acres at 16 baskets per acre; 1 82 acres worked for Myitpo experiment.
19. Singaing	101·61	2,857	2,709	2,097	13¼ baskets per acre for paddy land and 6 baskets for upland
20. Ye-u	45·65	1,056	1,056	662	4 baskets
21. Mingan	78·91	3,021	3,021	3,248	12·50 ,,
22. Minbya	107·50	4,300	3,235	3,232	9·375 ,, 12·50 ,,
23. Thegan-Gwason ...	87·08	2,370	2,030	2,576	11·94 ,,
24. Kyaukpyu	53·40	1,324	12,65	829	11·00 ,,
25. Mohnyin	50·39	2,133	1,007·75	...	·20 ,,
Total, 1938-39 ...	2,900·40	73,279	48,353·50	37,553·56	...
Total, 1937-38 ...	2,850·01	64,301·5	38,620·6	46,495·6	...

DIX II.

Farms for the year ended the 31st March 1939—concld.

Tenants' rebate for pure seed.	Nett rent assessed. (a) Collected up to 31st March 1939.	(b) Total outstandings up to 31st March 1939.	Gross rent per acre proposed for next year.	Remarks.
(7)	(8)		(9)	(10)
Per cent.	Rs. A. P.	Rs. A. P.		
5	1,389 0 0	...	25 baskets (inclusive of water-rate).	Actual area let out to tenants was 149·22 acres of paddy land.
...	298 14 0	...	Rs. Y^1 = 5 per acre Y^2 = 4 „ Y^3 = 2-8 „	*Sesamum*.—Actual area let out to tenants was 61·20 acres.
...	629 0 0	...	lbs. Y^1 = 280 „ Y^2 = 224 „ Y^3 = 140 „	*Groundnut*.—Actual area let out to tenants was 100·48 acres.
...	265 1 0	269 13 0	Same as col. 6	Grow dry crops, but none of them were bought by the Department. 92·35 acres were let out.
20	447 10 0	...	8 baskets	78·13 acres were let out and 1·82 acres worked for Myitpo experiments.
15	267 3 0	...	6 baskets	Actual area worked was 92·46 acres.
15	65 3 0	...	4 baskets	30·63 acres were let out and 3·20 acres worked for Myitpo experiment.
20	666 3 6	...	12·50 baskets and 9·375 baskets.	
20	963 13 6	...	12·50 „	
20 15	765 8 6	...	11·94 „	
20	320 6 3	...	11·00 „	
17	596 3 0	...	20 „	Opened during the year under report
...	20,382 5 3	500 4 0	...	
...	15,307 9 3	4,099 15 0	...	

Statement showing Working of Minor Seed Farms in operation

Circle. (1)	District. (2)	No. (3)	Name of Seed Farms. (4)	Area in acres. (5)	Total production (in baskets) (6)	Total seed taken over by the Department for distribution (in baskets). (7)
Arakan	Akyab	1	Gaungpyudaung	138·77	4,314	2,693
		2	Nagabauk ...	109·56	5,600	2,062
		3	Wagin ...	75·00	3,552	2,369
		4	Ròkpyin ...	58·26	2,320	1,078
		5	Rathedaung ...	35·00	960	...
		6	Kyoonbyin ...	35·00	612	...
		7	Kaingri ...	35 00	650	134
		8	Myaungbwe ...	22 50	884	...
		9	Ngathalauk ...	100·00	2,940	...
		10	Wegyidaung ...	100·00	2,428	...
		11	Paukpin ...	92·13	3,408	...
		12	Kyaukôk ...	32·00	800	...
		13	Kyauktan ...	50·00	280	...
		14	Somai ...	50·00	280	...
		15	Leiktaung ...	50.00	160	...
		16	Mayinchaung ...	26 45	512	...
		17	Dabruchaung ...	39·04	...	...
			Total ...	1,048·71	29,700	8,336
	Kyaukpyu ...	1	Myebon ...	50·00	1,620	...
			Total ...	50·00	1,620	...
	Sandoway ...	1	Sandoway Jail Land.	23·04	805	...
			Total ...	23·04	805	...
	Total : Arakan Circle.	19		1,121·75	32,125	8,336
Southern	Insein	1	Myaungtanga ...	60·00	1,420	...
		2	Thabyègôn ...	90·00	3,225	...
		3	Kyi-bin-in ...	60·00	1,475	...
		4	Kalein ...	60 00	2,075	600
		5	Leikchaung ...	60·00	2,325	255
		6	Hlezeik ...	60·00	1,050	...
		7	Pathi ...	48·11	1,250	...
		8	Ngapawin ...	50·00	1,500	...
		9	Thayegyun ...	17·12	375	...
		10	Zayatkwin ...	16·00	115	...
		11	Yemun ...	31·03	527	...
		12	Intine ..	25·00	455	...
			Total ...	577·26	15,792	855
	Pegu	1	Mayin South ...	50·00	815	...
		2	Waw ...	100·00	2,850	...
		3	Kamase ...	54·04	1,370	...
		4	Metkabin ...	100·00	2,770	...
		5	Pyinbon ...	40·00	1,370	...
		6	Myitkyo ...	100·00	2,778	...
		7	Myetpyu ...	100·00	1,675	...
			Total ...	544·04	13,628	...

or acquired during the year ended the 31st March 1939.

Actual distribution last year (in baskets). (8)	Gross rent per acre charged (in baskets). (9)	Percentage of rebate for pure seed. (10)	Nett rent assessed. (11) (*a*) Collected up to 31st March 1939.	Nett rent assessed. (11) (*b*) Total outstandings up to 31st March 1939.	Gross rent per acre proposed for next year (in baskets). (12)	Remarks. (13)
		Per cent	Rs. A. P.	Rs. A. P.		
3,540	9·374	20	887 4 6	...	9·374	
4,922	9·374	20	691 5 6	...	12·5	
3,183	9·374	20	502 4 0	...	12·5	
1,962	5·52	20	223 6 0	...	9·3	
1,254	10·00	15	255 14 9	...	10·0	
668	5·5	...	129 9 9	...	6·5	
640	5·52	20	107 8 3	...	6·5	
854	5·5	...	108 8 0	...	9·37	
...	...	...	...	...	...	
...	...	...	...	...	...	
...	...	...	...	...	...	
...	...	...	...	...	...	Rent free up to 31st March 1940
...	...	...	...	...	...	
...	...	...	...	...	...	
...	...	...	...	...	...	
...	...	...	...	...	...	
...	...	...	...	...	...	Rent free up to 31st March 1942.
17,023	...	...	2,905 12 9	...	...	
8,732	3·2	...	120 0 0	...	5·5	
8,732	...	...	120 0 0	...	5·5	
150	13·00	20	175 3 3	...	13·00	
150	...	...	175 3 3	...	13·00	
25,905	...	...	3,201 0 0	...	...	
260	8	20	295 10 0	...	6	
500	12 & 8	20	591 6 0	...	12 & 10	12 on 60 acres, 10 on 30 acres.
215	6	20	221 12 0	...	6	
630	14	20	537 10 0	...	12	
1,053	14	20	537 10 0	...	13	
320	7	20	158 12 0	...	7	35 acres under paddy
330	4	20	123 4 0	...	4	
...	2	*Nil.*	81 0 0	...	4	Under reclamation.
29	3	20	28 11 0	...	3	
25	3	20	7 9 3	10 6 9	...	Partial remission. Being surrendered.
102	5	20	85 9 0	...	5	Partial remission.
250	4	20	60 0 0	...	4	
3,714	...	...	2,728 13 3	10 6 9	...	
...	5	20	140 0 0	...	4	
400	6·9	20	392 2 0	...	7	
1,579	8	20	259 6 0	...	8	
2,250	12	20	671 6 0	...	12 & 5	12 on 93·25 acres, 5 on 6·75 acres.
1,080	10	20	217 10 0	...	10	
...	...	...	...	...	...	Rent free up to 1939-40.
340	4	20	100 13 0	...	4	Under reclamation.
5,649	...	...	1,781 5 0	...	...	

APPEN

Statement showing Working of Minor Seed Farms in operation

Circle. (1)	District. (2)	No. (3)	Name of Seed Farms. (4)	Area in acres. (5)	Total production (in baskets) (6)	Total seed taken over by the Department for distribution (in baskets). (7)
Southern —*concld.*	Hanthawaddy	1	Kyagan ...	61·12	1,500	...
		2	Taloktaw ...	75·00	...	...
		3	Tawku ...	27·32	1,000	...
		4	Nabegan ...	45·00	860	...
		5	Tumyaung ...	45·00	845	...
		6	Kayan ...	95·75	3,250	...
		7	Htongyi ...	100·00	3,640	...
		8	Thabyegan ...	27·33	500	...
		9	Hnget-U ...	77·53	1,500	...
			Total ...	554·05	13,095	...
	Tharrawaddy	1	Kainggale ...	105·36	3,213	...
		2	Kaingbyingyi ...	59·15	1,857	...
		3	Magvikwin ...	100·00	4,007	...
		4	Aingtaloke ...	50·00	1,420	...
		5	Sibnakwa ...	50·00	1,194	...
		6	Nyaunggon ...	54·42	1,420	...
		7	Hteinmadaw ...	54·36	1,370	...
		8	Thinbangone ...	55·44	1,741	...
		9	Letpadaw ...	47·91	1,518	...
		10	Shazibo ...	50·50	1,247	...
		11	Chaungnazu ...	34·00	1,656	...
		12	Shadaw ...	47·33	1,740	...
		13	Nyaungwaing ...	64·48	1,954	...
		14	Chaungzauk ...	48·06	2,787	...
		15	Le-u-Zu ...	59·05	2,760	...
		16	Gyogôn ...	50·00	1,242	...
		17	Kontha ...	18·35	392	...
			Total ...	948·41	31,518	...
	Prome ...	1	Maubingwe ...	25·00	1,250	...
		2	Padeinbin ...	100·00	3,818	...
			Total ...	125·00	5,068	...
	Total : Southern Circle.	47		2,748·76	79,101	855

DIX II (*a*).

or acquired during the year ended the 31st March 1939—contd.

Actual distribution last year (in baskets). (8)	Gross rent per acre charged (in baskets). (9)	Percentage of rebate for pure seed. (10)	Nett rent assessed. (11) (*a*) Collected up to 31st March 1939.	Nett rent assessed. (11) (*b*) Total outstandings up to 31st March 1939.	Gross rent per acre proposed for next year (in baskets). (12)	Remarks. (13)
		Per cent.	Rs. A. P.	Rs. A. P.		
220	6·2	20	234 14 0	...	6·2	
...	...	...	...	...	3	Totally destroyed by flood.
...	2·1	20	37 0 0	...	4·2	
239	6·2	20	...	172 13 0	5·2	
...	5·2	20	119 3 3	...	5·2	35 acres under paddy.
1,449	14·5	20	600 0 0	365 3 0	12·5	
2,531	8·3	20	268 13 0	256 0 0	10·4	
...	2·1	...	43 12 0	...	2·1	Under reclamation.
1,505	5·2	20	279 2 0	...	5·2	
5,944	...	...	1,582 12 3	794 0 0	...	
1,442	15·4	20	944 0 0	...	13·2	
891	14·8	20	530 0 0	...	14·8	
783	14·8& 21·2	20	1,088 0 0	...	15·9 & 21·2	50 acres at 15·9 & 50 acres at 21·2.
100	14·6	20	392 0 0	...	12·5	
625	8	20	224 0 0	...	8	
974	9·6	20	296 0 0	...	9·6	
215	5	20	141 5 0	...	5	
1,053	13·2	20	424 2 0	...	13·2	
1,238	7·2	20	195 8 0	...	9·6	
334	6·4	20	163 3 0	...	6·4	Partial remission.
548	5·5	20	122 6 0	...	9·2	
1,040	12	20	329 7 0	...	12	
1,472	5·6	20	219 4 0	...	9	
1,898	13·4	20	392 4 0	...	16·8	
1,694	20·2	20	637 11 0	...	20·2	
189	14·6	20	379 10 0	...	13·4	
...	5·6	20	64 9 0	...	5·6	Under reclamation.
14,496	...	...	6,543 5 0	...	...	
567	16·6	20	273 10 0	...	16·6	Rent free up to 1939-40.
598	...	20	...	...	...	
1,165	...	...	273 10 0	...	...	
30,968	...	...	12,909 13 6	804 6 9	...	

Statement showing Working of Minor Seed Farms in operation

Circle. (1)	District. (2)	No. (3)	Name of Seed Farms. (4)	Area in acres. (5)	Total production (in baskets). (6)	Total seed taken over by the Department for distribution (in baskets). (7)
Irrawaddy	Myaungmya	1	Yetho ...	100·00	3,145	...
		2	Kyonpadi ...	80·00	385	...
		3	Gayetgyi ...	33·62	1,131	...
		4	Nyaungbinseik ...	50·00	1,212	...
		5	Akwedan ...	50·00	440	...
		6	Yondaw ...	28·72	982	...
		7	Akun ...	50·00	1,102	...
		8	Kalaukthaik ...	100·00	3,695	...
		9	Nyaunggyaung ...	93·51	728	...
		10	Lindaing ...	50·00	1,908	...
		11	Pa-aing ...	93·24	2,414	...
		12	Pauktein ...	50·00	849	...
		13	Magu ...	60·00	1,257	...
		14	Gawduthaung ...	50·00	1,962	...
		15	Kanazogon ...	50·00	2,583	...
		16	Kyonbauk (Pettanchaungbya)	25·00	950	...
		17	Taunggu ...	50·00	2,334	...
		18	Kyonkanaung ...	50·00	1,044	...
		19	Mabe ...	100·00	3,511	...
		20	Sagamya ...	37·95	1,098	...
		21	Ngapyinthalet ...	22·93	927	...
		22	Sanywe ...	53·30	1,872	...
			Total ...	1,278·27	35,529	...
	Pyapôn ...	1	Thitpyuchaung	100·00	3,480	...
		2	Mayan ...	100·00	1,352	...
		3	Yegyaw ...	18·00	159	...
		4	Myatheindan ...	6·10	312	...
		5	Malot (Nyinaung)	57·54	2,392	...
		6	Shwedaunghmaw	101·66	1,050	...
		7	Peinnechaung ...	100·00	4,150	...
		8	Beluma ...	15·00	358	...
			Total ...	498·30	13,253	...

or acquired during the year ended the 31st March 1939—contd.

Actual distribution last year (in baskets). (8)	Gross rent per acre charged (in baskets.) (9)	Percentage of rebate for pure seed. (10)	Nett rent assessed. (11) (a) Collected up to 31st March 1939.	(b) Total outstandings up to 31st March 1939.	Gross rent per acre proposed for next year (in baskets). (12)	Remarks. (13)
		Per cent.	Rs. A. P.	Rs. A. P.		
522	10 per 88 acres. 5 per 12 acres.	20	661 12 0	...	10 per 88 acres. 5 for 12 acres.	
1,440	4	...	...	...	4	Rent remitted in full.
163	10	20	242 2 0	...	10	
211	12	20	432 0 0	...	12	
306	10	20	72 0 0	...	10	Rent remitted in full on 30 acres, 50 per cent in 20 acres.
387	14	20	225 0 0	39 0 0	14	
291	13¼	20	486 0 0	...	13½	
724	15	20	1,116 0 0	...	15	
444	13	...	...	...	13	Rent totally remitted.
250	13	10	520 10 0	...	13	
770	8	20 per cent on 43·24 acres 10 per cent on 50 acres.	566 12 0	...	8	
670	10	20	297 15 0	...	10	Rent remitted on 7 acres.
636	10	20	403 2 0	...	10	
318	17	20	607 2 0	...	17	
397	15½	20	609 10 0	...	15¼	
201	17	20	329 13 0	...	17	
1,398	17	20	666 6 0	...	17	
344	15¼	20	339 8 0	...	15¼	Rent remitted 30 per cent and 60 per cent on nett rent.
334	15	20	1,176 0 0	...	15	
667	Rs. 7·9	20	...	...	Rs. 7·9	Rs. 198-4-0 to Deputy Commissioner Myaungmya.
205	Rs. 7·6	20	...	...	Rs. 7·6	Rs. 139-0-0 to Deputy Commissioner, Myaungmya.
...	...	...	...	...	...	Rent free.
10,678	...	...	8,751 12 0	39 0 0	...	
1,443	15	20	1,090 0 0	...	15	
773	15	Rebate refused on 20 acres & 20 per cent for 20 acres.	412 12 9	...	15	60 acres of this farm being surrendered. ½ rent remitted on 20 acres.
230	8	20	49 15 0	...	8	Half rent remitted.
119	16	20	74 1 6	...	16	
1,198	12	20	552 6 0	...	13	
25	5	20 Rebate refused on 4·50 acres.	...	134 0 0	5	Credited on 3-4-39.
657	8	20	640 0 0	...	10	
...	...	...	...	...	...	Rent free.
4,445	...	...	2,819 3 3	134 0 0	...	

Statement showing Working of Minor Seed Farms in operation

Circle. (1)	District. (2)	No. (3)	Name of Seed Farms. (4)	Area in acres. (5)	Total production (in baskets). (6)	Total seed taken over by the Department for distribution (in baskets). (7)
Irrawaddy —*contd.*	Bassein	1	Thabye ...	100·00	3,180	...
		2	Paukpin-in ...	51·75	2,140	...
		3	Hlezeik ...	25·00	806	...
		4	Payachaung ...	25·00	647	...
		5	Kaingdagyi ...	100·00	2,891	...
		6	Nyaungngu ...	50·00	1,768	...
		7	Kangon ...	50·00	2,071	...
		8	Paminawaddy ...	75·00	1,366	...
		9	Letkoke ...	50·00	1,476	...
		10	Letsaung ...	50·00	1,192	...
		11	Zayathla ...	33·23	903	...
		12	Ngathainggyaung	31·49	1,269	...
		13	Yegyi ...	65·97	2,596	...
		14	Begayet ...	121·34	3,603	...
		15	Thitseingone ...	35·63	1,500	...
		16	Onbinsu (Thaunggyi).	40·00	973	...
		17	Mankya ...	40·00	1,741	...
		18	Taunglon ...	39·53	915	...
		19	Apinnhase ...	108·18	3,068	...
			Total ...	1,092·12	34,105	...
	Henzada	1	Kyagyet ...	97·84	2,483	...
		2	Chingwin ...	79·58	2,368	...
		3	Nankala ...	42·82	1,170	...
		4	Letthama ...	57·08	2,092	...
		5	Tabingon ...	14·27	58	...
		6	Kawsan ...	100·00	810	...
		7	Yetho ...	10·00	330	...
		8	Pyindaungkwin	30·42	1,386	...
		9	Deik-in ...	50·00	959	...
		10	Talainggwin ...	7·00	224	...
			Total ...	489·01	11,880	...

DIX II (*a*).

or acquired during the year ended the 31st March 1939—contd.

Actual distribution last year (in baskets). (8)	Gross rent per acre charged (in baskets). (9)	Percentage of rebate for pure seed. (10)	Nett rent assessed. (11) (*a*) Collected up to 31st March 1939.	Nett rent assessed. (11) (*b*) Total outstandings up to 31st March 1939.	Gross rent per acre proposed for next year (in baskets). (12)	Remarks. (13)
		Per cent.	Rs. A. P.	Rs. A. P.		
1,332	11	20	791 14 0	...	11	
617	22	20	780 3 0	..	22	
362	12	20	228 0 0	...	12	
263	11½	20	207 0 0	...	11½	
1,049	8	20 per cent for 86 acres. Refused 10 acres.	568 0 0	...	8	4 acres pagoda land not assessed to rent.
325	8	20	302 0 0	0 6 0	8	Re. 0-6-0 credited on 6-4-39.
619	10	20	380 0 0	...	10	
313	8	20	285 0 0	...	8	1/3rd rent remitted.
1,039	12	20	208 13 0	...	12	
230	8	20	348 0 0	...	10	
368	Rs. 5-10-0	20	22 4 0	...	Rs. 5-10-0	Rs. 127-12-0 to Deputy Commissioner, Bassein.
633	Rs. 7-14-0	20	64 8 0	...	Rs. 7-14-0	Rs. 135-8-0 to Deputy Commissioner, Bassein.
748	Rs. 5-11-0	20	...	...	Rs. 5-11-0	Rs. 300 to Deputy Commissioner, Bassein.
947	Rs 5-2-0	20	...	...	Rs. 5-2-0	Rs. 500 to Deputy Commissioner Bassein.
137	...	...	...	...	Rs. 5-0-0	Rent free.
362	5	20	108 0 0	...	6	
682	...	...	...	...	5	Rent free.
...	...	...	...	...	...	
...	8½	20	279 10 0	...	8½	Rs. 364-12-0 to Deputy Commissioner, Bassein.
10,026	...	...	4,573 4 0	0 6 0	...	
470	4	20	266 14 0	...	4	
441	11½ for 58·91 acres; 5 for 20·67 acres.	20	531 4 0	...	12 for 58·91 acres 5 for 20·67 acres.	
309	10	20	262 6 0	...	10	
450	13	18 per cent on 20 acres 20 per cent on 37·80 acres.	494 4 0	...	13	
80	5	...	...	...	5	Rent remitted in full.
99	5	Rebate refused on 8½ acres & rest 20 per cent.	113 0 0	...	5	Rent remitted for 4 acres.
174	11	20	79 3 0	...	11	
219	9	Rebate refused on 2 acres & rest 20 per cent.	189 9 0	...	9	
....	...	...	...	...	...	Rent free.
...	4	20	18 6 0	...	4	
2,242	...	...	1,954 14 0	...	...	

APPEN

Statement showing Working of Minor Seed Farms in operation

Circle.	District.	No.	Name of Seed Farms.	Area in acres.	Total production (in baskets)	Total seed taken over by the Department for distribution (in baskets).
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Irrawaddy—*concld.*	Maubin ...	1	Sangin ...	60·00	1,185	...
		2	Kazingayet ...	16·87	395	...
		3	Taloklat ...	40·16	739	188
		4	Kyontanaw ...	13·87	395	...
			Total ...	130·90	2,714	188
	Total: Irrawaddy Circle.	63	...	3,488·60	97,481	188
Tenasserim	Amherst ...	1	Kwanton South	50·22	1,445	1,445
		2	Kwanton North	55·50	1,581	1,581
		3	Kyakhat Chaung	52·83	431	431
		4	Kyaikmaraw ...	50·00	388	132
		5	Kamawet ...	44·74	1,447	1,447
		6	Kanni ...	83·00	1,690	1,690
		7	Settwe ...	30·00	475	475
		8	Wegali ...	42·90	700	700
		9	Kawoot ...	11·10	360	360
		10	Kyonkadat ...	21·60	...	...
		11	Webwe ...	26·51	600	...
		12	Tawbaung ...	25·20	625	...
		13	Kyunkadon ...	127·34	2,460	...
		14	Kawywe ...	61·94	2,000	2,000
		15	Bilo ...	75·00	800	...
		16	Hnidon ...	50·00	350	98
		17	Kwantaywa-haung.	50·00	1,685	...
		18	Winkyan ...	50·00	...	...
		19	Kamakaram ...	40·40	...	...
		20	Pha-aunggone ...	50·00	425	...
		21	Kawparan ...	63·00	...	...
			Total ...	1,061·28	17,462	10,359

or acquired during the year ended the 31st March 1939—contd.

Actual distribution last year (in baskets). (8)	Gross rent per acre charged (in baskets). (9)	Percentage of rebate for pure seed. (10)	Nett rent assessed, (a) Collected up to 31st March 1939. (11)	Nett rent assessed, (b) Total outstandings up to 31st March 1939. (11)	Gross rent per acre proposed for next year (in baskets). (12)	Remarks. (13)
		Per cent.	Rs. A. P.	Rs. A.		
10	8 for 16·80 acres. 9 for 20·00 acres. 10 for 21·90 acres.	20	397 13 0	...	8, 9 & 10	
140	11	20	117 11 3	...	11	
443	7	20	174 13 0	...	7	
380	9	20	88 0 0	...	9	
973	...	...	778 5 3	...	...	
28,364	...	...	18,877 6 6	173 6 0	...	
600	8	20	272 4 0	...	9	
1,275	10	20	417 0 0	...	10	
542	8	20	184 6 0	...	8	
...	...	...	...	...	4	
1,050	10	20	313 13 0	...	10	
636	7	20	358 8 0	...	7	
400	...	...	...	...	10	Rent free for 3 years from 1936-37.
...	...	...	...	...	...	Rent free for 5 years from 1937-38.
250	6	20	48 10 0	...	10	
...	...	...	...	...	...	Not worked in 1938-39.
...	...	...	...	...	...	Rent at 4 baskets per acre will be received in 1940-41.
140	...	...	...	...	5	
...	...	...	...	...	...	Will receive 5 baskets per acre in 1942-43.
...	...	...	...	...	...	Will receive 4 baskets per acre in 1940-41.
...	...	...	...	...	...	Will receive 7 baskets per acre in 1940-41.
...	...	...	...	...	...	Rent free for 3 years from 1938-39.
...	...	...	...	...	...	Rent at 10 baskets per acre will be received in 1940-41.
...	...	...	...	...	...	Starts opening in 1939.
...	...	...	...	...	...	Do.
...	...	...	...	...	...	Will receive 4 baskets per acre in 1940-41.
...	...	...	...	...	...	Starts opening in 1939.
4,893	...	...	1,594 9 0	...	...	

APPEN

Statement showing Working of Minor Seed Farms in operation

Circle.	District.	No.	Name of Seed Farms.	Area in acres.	Total production (in baskets)	Total seed taken over by the Department for distribution (in baskets).
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tenasserim—*concld.*	Thatôn ...	1	Thatôn ...	42·04	1,128	1,128
		2	Theinzeik ...	50·75	1,932	1,932
		3	Anaingpun ...	53·34	1,480	1,480
		4	Kywegyan ...	81·54	1,400	1,400
		5	Myatlegyaung ...	60·32	2,000	2,000
		6	Htainbin ...	50·00	2,026	2,026
		7	Hlaingbwè ...	86·27	1,935	1,850
		8	Bisagat ...	119·98	4,135	4,135
		9	Kawkayeik ...	34·74	950	275
		10	Ahlat ...	71·11	3,000	3,000
		11	Htanbingyaung	62·92	1,800	1,800
		12	Le-cin ...	54·36	2,900	2,900
		13	Mukani ...	71·67	470	...
		14	Naungpatoke ...	35·28	670	670
		15	Shangaing ...	50·00	1,235	1,235
		16	Winsein ...	60·85	1,050	1,050
		17	Mayangon ...	65·60	2,525	2,525
		18	Haungkarin ...	68·25	1,752	1,752
		19	Kyaikkalo ...	89·60	2,600	2,600
		20	Kadaikalay ...	54·47	1,615	1,615
		21	Okpoywa ...	30·00	800	800
		22	Letpan ...	51·77	1,200	1,200
		23	Kawlon ...	50·00	150	150
		24	Kathapa ...	50·00	2,045	2,045
		25	Thogya ...	24·75	529	490
		26	Zaikare ...	50·00	1,500	1,500
		27	Dingazeik ...	48·06	2,250	2,250
		28	Naunggala ...	50·00	...	...
		29	Sawkesu ...	75·55	561	...
		30	Ohndabin ...	22·53	625	...
		31	Pangon ...	20·80	...	...
		32	Kyauklongyi ...	40·00	...	...
			Total ...	1,776·55	46,263	43,808
	Tavoy ...	1	Myaungbauk ...	50·50	649	649
		2	Wedi ...	30·00	630	530
		3	Lower Yebyu ...	43·97	790	790
		4	Kyetyettwin ...	19·88	410	410
		5	Pyinmachaung	50·00	...	...
		6	Tarokepyin ...	50·00	...	..
			Total ...	244·35	2,479	2,379
	Total, Tenasserim Circle.	59		3,082·18	66,204	56,546

)r acquired during the year ended the 31st March 1939—contd.

Actual distribution last year (in baskets).	Gross rent per acre charged (in baskets).	Percentage of rebate for pure seed.	Nett rent assessed. (*a*) Collected up to 31st March 1939	Nett rent assessed. (*b*) Total outstandings up to 31st March 1939.	Gross rent per acre proposed for next year (in baskets).	Remarks.
(8)	(9)	(10)	(11)		(12)	(13)
		Per cent	Rs. A. P.	Rs. A. P.		
654	10	20	...	278 2 0	10	Remission of 5 baskets is also sanctioned in addition.
1,185	10	20	329 10 0	...	10	
710	7	20	219 0 0	...	7	
1,708	10 & 7	20	512 3 0	...	10 & 7	
2,200	10	20	415 6 0	...	15	
2,017	10	20	336 0 0	...	10	
500	3	...	182 4 0	...	3	
3,900	10	20	656 13 0	...	10 & 7	
350	8	20	173 6 0	...	8	
2,010	10	20	516 11 0	...	10	
800	10	20	428 6 0	...	10	
2,061	10	20	356 11 0	...	12	
...	...	...	...	...	...	Rent free for 3 years from 1938-39.
94	6	20	...	125 11 0	6	
530	7	20	208 14 0	...	7	
1,150	10	20	412 7 0	...	10	
1,444	10	20	421 12 0	...	10	
1,150	7	20	265 12 0	...	7	
1,500	10	20	424 13 0	...	10 & 7	
1,435	10	20	331 6 0	...	13	
600	10	20	206 6 0	...	12	
...	...	...	...	...	7	
...	...	...	...	...	...	Rent free for 4 years from 1937-38
...	...	...	...	...	4	
...	...	...	...	...	7	
...	...	...	...	...	...	Rent at 5 baskets per acre will be received in 1940-41.
...	...	...	...	...	...	Rent free for 2 years.
...	...	...	...	...	...	Starts opening in 1939. Will receive 6 baskets per acre in 1941-42
...	...	...	...	...	...	Rent at 10 baskets per acre in 1940-41.
...	...	...	...	...	10	
...	...	...	...	...	...	Rent at 8 baskets per acre will be received in 1940-41.
...	...	...	...	...	...	Rent at 4 baskets per acre will be received in 1940-41.
25,998	...	...	6,397 12 0	403 13 0	...	
557	5	20	112 8 0	...	5	Remission of 50 baskets sanctioned
876	7	20	120 12 0	...	7	
320	...	...	...	...	...	Rent free for 5 years from 1936-37
194	...	...	...	...	...	Rent free for 4 years from 1936-37.
...	...	...	...	...	...	Not rented out as yet.
...	...	...	...	...	...	Do.
1,947	...	...	233 4 0	...	...	
32,838	...	...	8,225 9 0	403 13 0	...	

APPEN

Statement showing Working of Minor Seed Farms in operation

Circle. (1)	District. (2)	No. (3)	Name of Seed Farms. (4)	Area in acres. (5)	Total production (in baskets) (6)	Total seed taken over by the Department for distribution (in baskets). (7)
East Central.	Yamèthin ...	1	Zigôn ...	19·26	280	132·25
		2	Nyaung-ang ...	10·65	104	104
			Total ...	29·91	384	236·25
	Toungoo ...	1	Shwe-le-in ...	75·00	2,128·4	1,196
		2	Kelingon	100·00	1,132·6	616·5
		3	Kongyi ...	70·00	...	222·2
		4	Pade ...	50·00	...	...
		5	Zaba ...	21·91	809	524
		6	Oktwin ..	152·49	3,405	1,609
		7	Sibintha ...	493·38	5,280	...
			Total ...	962·78	12,755·0	4,167·7
	Pegu (Nyaunglebin Subdivision).	1	Pa-aungwe ...	50·00	2,395	...
		2	Pothet-hnan ...	25·00	1,225	...
		3	Thategôn ...	60·00	3,130	768
		4	Kyauktaga ...	60·00	2,868	...
			Total ...	195·00	9,618	768
	Total, East Central Circle.	13	...	1,187·69	22,757	5,171·95
West Central.	Minbu ...	1	Wetthike (Tawzeik).	98·68	1,750	1,025
		2	Kyaukye-kyun	18·10	...	...
		3	Anaukkine ...	2·01	...	...
			Total ...	118·79	1,750	1,025
	Pakôkku ...	1	Pakôkku ...	40·97	...	...
	Total, West Central Circle.	4	...	159·76	1,750	1,025
Northern Circle.	Kyauksè ...	1	Myittha ...	29·33	1,042	1,002
	Total, Northern Circle.	1		29·33	1,042	1,002
	GRAND TOTAL, 1938-39.	206	...	11,818·07	300,460	73,123·95
	GRAND TOTAL, 1937-38.	194	...	11,498·44	242,559·3	54,702·8

or acquired during the year ended the 31st March 1939—concld.

Actual distribution last year (in baskets). (8)	Gross rent per acre charged (in baskets). (9)	Percentage of rebate for pure seed. (10)	Nett rent assessed. (a) Collected up to 31st March 1939. (11)	Nett rent assessed. (b) Total outstandings up to 31st March 1939. (11)	Gross rent per acre proposed for next year (in baskets). (12)	Remarks (13)
		Per cent.	Rs. A. P.	Rs. A. P.		
...	10	20	85 15 0	...	10	
...	6·3	10	42 6 0	...	6	
...	...	...	128 5 0	...	...	
534·7	66 at 12 9 at free	17·9	524 12 0	...	66 at 12 9 at free	
302·9	49·50 at 4 18·50 at 3 32·00 at free.	20	151 3 0	..	49·50 at 4 18·50 at 3 32·00 at free	
...	free	...	...	...	25 at 5 45 at free	
...	free	..	...	...	Free	
1,000	17	20	214 9 0	...	17	
884	9	20	610 6 0	113 6 0	9	Tenant absconded.
...	119·00 at 6 80·25 at 7 36·80 at Rs. 10. 221·27 at free. 35·16 at free.	...	1,127 5 3	...	134·00 at 7 97·00 at 8 23·74 at Rs. 10 203·48 at free 35·16 at free	
2,721·6	...	...	2,628 33	113 6 0	...	
...	14	20	442 5 0	...	14	
...	23 at 6 2 at free	20	79 8 0	...	8	
...	16	20	499 3 0	...	16	
...	16	20	522 4 0	...	16	
...	...	..	1,543 4 0	...	...	
2,721·6	...	...	4,299 12 3	113 6 0	...	
931	Half the produce.	...	497 0 0	123 12 0	15 baskets per acre (inclusive of water rate).	Actual area let out was 65·20 acres.
...	...	...	...	...	2 baskets	Only 5 acres are suitable for gram crop for which this farm is intended
...	...	...	...	...	...	Acquired in 1938.
931	...	...	497 0 0	123 12 0	..	
...	...	...	...	...	...	Acquired in 1939.
931	...	...	497 0 0	123 12 0	...	
678	6	20	105 9 0	...	6	
678	...	...	105 9 0	...	...	
122,405·6	...	...	48,116 2 3	1,618 11 9	...	
127,172·9	...	...	58,922 0 6	2,667 13 9	...	

APPENDIX III.

Statement showing Total Seeds distributed from Experimental, Major, Minor and Private Seed Farms during the year ended the 31st March 1939.

Circle.	Rice. lb.	Cotton. lb.	Groundnut lb.	Sesamum. lb.	Beans. lb.	Gram. lb.	Wheat. lb.	Millet. lb.	Miscellaneous lb.	Total. lb.	Sugarcane. Setts.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Arakan ...	2,619,100	...	...	...	180	...	...	...	1,863	2,621,143	...	
Irrawaddy ...	3,837,850	...	1,500	...	...	16,900	...	...	...	3,856,250	610	
Southern ...	7,019,925	...	...	...	...	...	...	...	...	7,019,925	8,000	
Tenasserim ...	2,077,300	...	...	...	...	...	...	...	121	2,077,421	557,015	
West Central ...	421,060	3,404	190,080	22,693	2,819	4,180	250	31,934	41,221	717,641	10,000	
East Central ...	936,950	...	124,924	10,112	68,259	64,290	100	4,140	19,348	1,228,123	569,000	
Northern ...	2,979,650	90	14,480	1,539	10,850	52,360	18,970	2,520	715	3,081,174	...	
Myingyan ...	25,000	246,165	9,650	14,225	17,394	7,560	4,870	8,428	2,158	335,450	...	
Economic Botanist	14,256	...	...	148	250	110	237	...	153	15,154	...	
Total, 1938-39 ...	19,931,091	249,659	340,634	48,717	99,752	145,400	24,427	47,022	65,579	20,952,281	1,144,625	
Total, 1937-38 ...	18,906,023	371,901	331,439	24,835	116,828	94,521	11,175	48,240	33,816	19,938,778	5,017,841	

APPENDIX IV.

Statement showing Grafts, Seedlings, etc., distributed during the year ended the 31st March 1939.

Circle.	Mangoes.	Plantain.	Coconut.	Oil-Palm.	Pine-apples.	Custard apples.	Sapotas.	Litchis.	Citrus.	Mango-steens.	Coffee.	Miscellaneous.	Remarks.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Arakan ...	256	...	...	...	818	...	4	54	83	6	...	79	
Irrawaddy ...	...	...	...	...	351	...	1	16	13	...	...	20	
Tenasserim ...	389	...	10	2,957	3,010	...	81	108	633	5	486	184	
* Southern ...	70	...	...	...	712	...	23	...	123	...	...	1,512	
East Central ...	...	100	...	...	955	...	...	...	14	...	...	12	
West Central ...	52	...	...	...	719	...	92	...	221	...	...	27	
Myingyan ...	...	...	...	...	...	...	...	...	127	...	...	2	
Northern ...	...	...	...	...	1,700	...	...	36	...	...	...	...	
Economic Botanist	...	...	...	...	...	...	...	...	...	...	...	...	
Total, 1938-39	767	100	10	2,957	8,265	...	201	214	1,214	11	486	1,836	
Total, 1937-38	323	350	27	46	4,635	...	115	101	521	57	254	750	

* Includes Rice Research Officer's figures.

APPENDIX V.

Statement showing Implements distributed by Departmental Agency during the year ended the 31st March 1939.

Circle.	Improved Ploughs.		Harrows.	Seed drills.	Intercultivators.		Sugar-cane crushers.	Miscellaneous.	Remarks.
	Shares.	Bodies.			Indigenous.	Imported.			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Arakan	357	178	17	...	...	1	...	...	......
Irrawaddy	3,166	1,196	...	...	...	...	...	*2	*Hindustan Ploughs.
Southern	430	92	...	...	...	...	...	...	......
Tenasserim	1,243	...	...	...	...	7	26	12	Excluding 351 Shaulein shares issued.
West Central	2,001	505	83	...	1,108	58	...	†85	† 41 Chaff cutters and 44 Cyprus ploughs.
East Central	833	100	...	1	1	47	...	98	......
Northern	1,241	7	...	...	...	13	...	‡16	‡ 15 B.T.S.L. points and 1 gwinset.
Myingyan	5,401	175	...	187	296	265	...	100	......
Total, 1938-39 ...	14,672	2,253	100	188	1,405	391	26	313	
Total, 1937-38 ...	17,571	1,197	1,803	71	...	379	35	119	

APPENDIX VI.

District Demonstrations.

Circle.	Varietal.		Manurial.			Implements.						Methods of Cultivation.				Treatment of pests and Diseases.				
	Paddy.	Other crops.	Paddy.	Other crops.	Storage of F.Y.M.	Ploughs.	Intercultivators.	Seed Drills.	Gyokes.	Ridgers.	Harrows.	Lines sowing with intercultivation.	Double cropping.	Winter ploughing and preparatory tillage.	Anti-erosion layout.	Prevention of smut on Pyaung.	Pyaungs resistant to strigalutea.	Foot rot of betel-vine.	Miscellaneous.	Miscellaneous.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Arakan ...	223	14	...	...	...	190	...	...	...	...	190	...	...	...	...	...	...	...	...	...
Irrawaddy ...	576	16	210	...	96	788	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Southern ...	131	113	99	...	...	48	3	...	2	...	...	...	...	...	...	...	...	2	...	37
Tenasserim .	265	68	99	2	...	161	25	...	2	...	12	36	6	...	...	...	...	...	27	...
West Central ...	15	400	36	...	22	510	660	...	...	...	...	272	151	135	...	53	...	...	...	186
East Central ...	397	937	168	275	36	143	53	4	...	...	...	654	197	...	...	...	...	6	...	...
Northern ...	21	85	190	...	440	151	101	10	...	...	...	169	115	...	2	...	...	...	63	...
Myingyan ...	...	11	...	...	99	280	377	117	140	100	57	442	108	352	49	315	5	...	...	5
Total 1938-39 ...	1,628	1,644	802	277	693	2,271	1,221	131	144	100	259	1,573	577	487	51	368	5	8	90	228
Total 1937-38 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

APPENDIX VII.

Statement of Seed and Implement Advance Account for the year 1938-39.

Circle. (1)	Amount of allotment sanctioned. (2)	Amount drawn during the year. (3)	Amount repaid during the year. (4)	Liability on 31st March 1939. (5)	Remarks. (6)
	Rs.	Rs. A. P.	Rs. A. P.	Rs. A. P.	
Arakan	20,000	21,652 15 6	21,063 4 3	19,133 14 0	
Southern	16,000	13,555 8 6	14,329 9 3	13,258 14 9	
Irrawaddy	28,900	28,136 4 9	22,761 5 9	17,150 12 9	
Tenasserim	17,000	15,892 15 0	16,616 5 9	5,193 4 0	
East Central	23,000	20,967 15 0	13,452 0 9	16,958 9 6	
West Central	14,000	13,999 3 6	9,667 10 0	14,123 10 0	
Myingyan	42,000	43,104 9 0	46,875 0 3	17,241 13 9	
Northern	25,000	20,000 11 0	20,877 7 0	21,094 4 6	
Professor of Agriculture ...	600	449 7 0	479 13 0	...	
Rice Research Officer ...	500	348 10 0	370 12 0	...	
Total, 1938-39 ...	1,87,000	1,78,108 3 3	1,66,493 4 0	1,24,155 3 3	
Total, 1937-38 ...	1,74,200	1,57,414 10 6	1,71,058 0 3	1,00,576 7 1	

Statement showing the consolidated Balance Sheet of the Agricultural Seed and Implement Advance for the year 1937-38.

Profit.	Rs. A. P.	Loss.	Rs. A. P.
Arakan Circle	849 6 6	Arakan Circle	...
Southern Circle	919 1 6	Southern Circle	127 4 0
Irrawaddy Circle	369 0 9	Irrawaddy Circle	369 0 9
Tenasserim Circle	456 9 0	Tenasserim Circle	664 3 0
East Central Circle	1,321 7 8	East Central Circle	274 8 9
West Central Circle	556 0 9	West Central Circle	461 3 3
Myingyan Circle	1,608 12 6	Myingyan Circle	754 10 0
Northern Circle	977 11 0	Northern Circle	337 1 0
Assistant Director of Agriculture in charge of College Farm, Mandalay.	33 2 0	Total ...	2,987 14 9
Rice Research Officer	30 0 0		
Total ...	7,121 3 8	Nett Profit ...	4,133 4 11

APPENDIX VIII.

Statement showing Expenditure and Receipts for the year ended the 31st March 1939.

(Provisional figures as supplied by the Accountant-General, Burma.)

EXPENDITURE.	Rs.	Rs.
33. Agriculture—Charged—		
Superintendence	36,110	
Expert Staff	32,974	
Agricultural College	29,162	
Rice Research	17,374	
Markets Section	10,980	
Charges in England	61,902	
Loss by Exchange	370	
		1,88,872
33. Agriculture—Voted—		
Superintendence	34,159	
Expert Staff	3,25,398	
Experimental Farms	1,87,393	
Agricultural Experiments	33,188	
Agricultural College	1,40 013	
Other Agricultural Training	15,126	
Sericulture	14,289	
Rice Research	16,498	
Tobacco Research Scheme	3,629	
Botanical and Public Gardens	* 46,000	
Public Exhibition and Fairs	10,083	
Markets Section	25,128	
Rural Uplift Scheme	4,656	
Sugar Excise Fund Scheme	3,339	
Works	4,016	
Charges in England	4,503	
Loss by Exchange	21	
		8,67,439
36 Industries—Scheme for development of Sericultural Industry.		5,314
41. Civil Works—Minor Works		8,724
Cotton Improvement Scheme		11,798
Total ...		10,82,147
Average expenditure for the preceding five years ...	———	†8,02,052
RECEIPTS.		
XXV.—Agriculture—Agricultural Receipts	———	1,20,982

* Not under the control of Agricultural Department.

† Excludes figures under (1) Botanical and Public Gardens, (2) Charges in England, and (3) 41. Civil Works—Minor Works—(Agricultural Department).

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APPENDIX IX.

Statement showing distribution of Officers and Staff of the Department during the year ended the 31st March 1939.

Office. (1)	Indian Agricultural Service. (2)	Burma Agricultural Service. Class I. (3)	Burma Agricultural Service. Class II. (4)	Burma Agricultural Assistants Service. (5)	Junior Agricultural Assistants. (6)	Fieldmen and Preparers. (7)	Clerks (permanent). (8)	Remarks. (9)
Director of Agriculture ...	1	...	...	...	...	...	1 Superintendent 1 Stenographer 9 Clerks	
Principal, Agricultural College ...	...	...	...	...	...	..	7 (a)	(a) Includes one Librarian, one Artist Photographer and one Storekeeper.
Professor of Agriculture ...	1 (b)	...	.	3	...	2	1	(b) The post of Principal is held by the Professor of Agriculture.
Agricultural Chemist ...	...	1 (c)	2	3	...	2	...	(c) Temporary appointment counted against permanent post.
Economic Botanist ...	1	...	1	2	...	3	...	
Mycologist	...	...	1	2	...	2	...	
Entomologist	...	...	1	4	2	6	1	
Deputy Director, Arakan Circle ...	...	1	1	5	...	5	3	
Deputy Director, Southern Circle	1	...	1	6	...	4	3	
Deputy Director, Irrawaddy Circle	...	1	1	10	...	11	4	
Deputy Director, Tenasserim Circle	...	...	2	8	1	5	4	
Deputy Director, East Central Circle.	...	1	1	8	...	6	5	
Deputy Director, West Central Circle	..	...	2	10	...	7	4	
Deputy Director, Myingyan Circle	1	...	1	6	3	5	4	
Deputy Director, Northern Circle	...	1	1	9	1	10	4	
Rice Research Officer ...	1	...	1	5	1	7	2	
Provincial Marketing Officer ...	1	...	...	3	...	...	...	
Officers on leave or deputation .	1	...	...	1	...	...	...	
Total ...	8	5	16	85	8 (ii)	75	53	
Existing Sanction ...	13 (i)		16	106	2 (iii)	76	53	

(i) The sanctioned cadre of Burma Agricultural Service, Class I, is combined with Indian Agricultural Service.
(ii) There is no sanctioned cadre for Junior Agricultural Assistants except two posts for Sericulture. The existing incumbents are counted against the sanctioned cadre of Burma Agricultural Assistants Service.
(iii) Sanctioned cadre of Junior Agricultural Assistants for Sericulture.

APPENDIX X.

Statement showing number of Students under Training during the year ended the 31st March 1939.

Agricultural College or Schools. (1)	Duration of course. (2)	Number of students at the beginning of the year. (3)	Admitted during the year. (4)	Number on roll at the end of the year. (5)	Number of successful passes. (6)	Employment of passed candidates. Government employ. (7)	Employment of passed candidates. Private. (8)	Remarks. (9)
1. *Pyinmana Agricultural School*—								
First year—Ordinary (4 years).	Four years' course	25	24	13	...	...	...	
First year—Advance (3 years).	Four years' course	11	11	2	...	...	...	
First year—Special	Four years' course	2	2	2	...	...	...	Taking Agricultural subjects only without stipend. No certificate granted.
Second year ...	Four years' course	10	...	4	...	...	...	
Third year ...	Four years' course	16	...	13	...	...	...	
Fourth year ..	Four years' course	14	...	12	12	5	3	
2. *Farm Schools*—								
Hmawbi ...	Nine months' course.	10	...	10	10	4*	6	* One Fieldman at Hmawbi, one Demonstrator each at Syriam Akyab and Letpadan.
Mahlaing ...	Nine months' course.	14	...	12	12	3	9	
Tatkon ...	Nine months' course.	10	...	9	9	2	7	
3. *Training of Adult Cultivators*—								
Tenasserim Circle—								
Mudon Central Farm—								
1st course ...	One month ...	...	3	...	3	...	...	
2nd course ...	One month ...	...	22	...	22	...	...	
3rd course ..	One month ...	...	7	...	7	...	...	
Special courses ...	One year ...	...	1	...	1	...	...	Deputed by the Deputy Commissioner, Tavoy.
Special courses ...	Two months ...	...	5	...	5	...	..	Deputed by Superintendent, Lashio, N.S.S.
East Central Circle ...	Half a month to six months.	6	3	3	9	1	8	
East Central Circle ...	Two months and a half.	...	2	...	...	...	2	
West Central Circle ...	Two months ...	...	15	...	No examination held.			
Arakan Circle ...	Five weeks ...	...	1	...	Do.	...	1	
Arakan Circle ...	Three months ...	...	4	...	Do.	...	4	
Arakan Circle ...	Seven months ...	...	1	...	Do.	...	1	
Northern Circle ...	Four—six months...	...	12	10	10	...	10	

G.B.C.P.O.—No. 117. D. of A., 16-11-39—530.

Map

OF

BURMA

SHOWING

[illegible]	...	[illegible]	[illegible]
Meiktila	...	23·64	*Cotton.*
Ye-U	...	45·65	*Paddy.*
Mohnyin	...	50.39	*Paddy.*